CHNOLOGY DEPT]

Gas Journal

VOL. 277. 106TH YEAR. LONDON, MARCH 24, 1954 NO. 4738. PRICE 1/3

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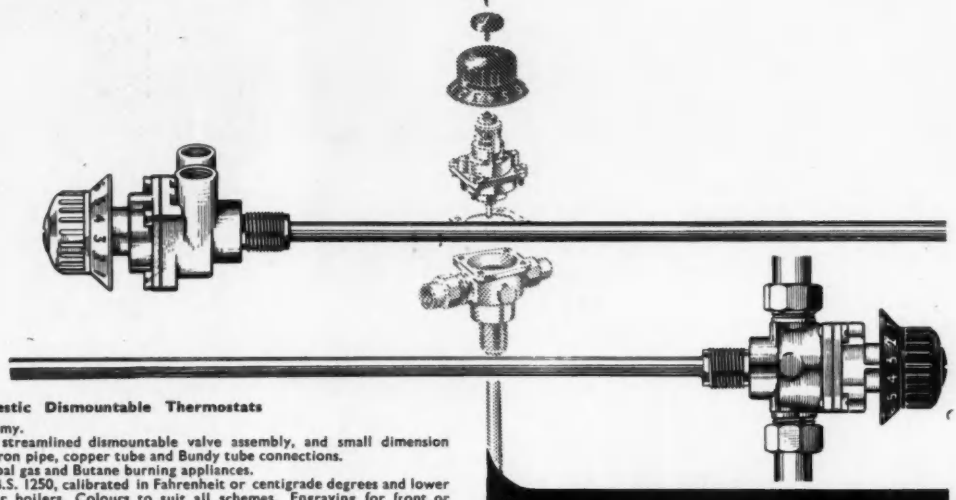
DOMESTIC DISMOUNTABLE THERMOSTATS



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Completely redesigned with streamlined dismountable valve assembly, and small dimension body. Patterns available for iron pipe, copper tube and Bundy tube connections.
Interchangeable models for coal gas and Butane burning appliances.
Dials available calibrated to B.S. 1250, calibrated in Fahrenheit or centigrade degrees and lower temperature ranges for water boilers. Colours to suit all schemes. Engraving for front or side mounting.
Fixed or variable by-pass.
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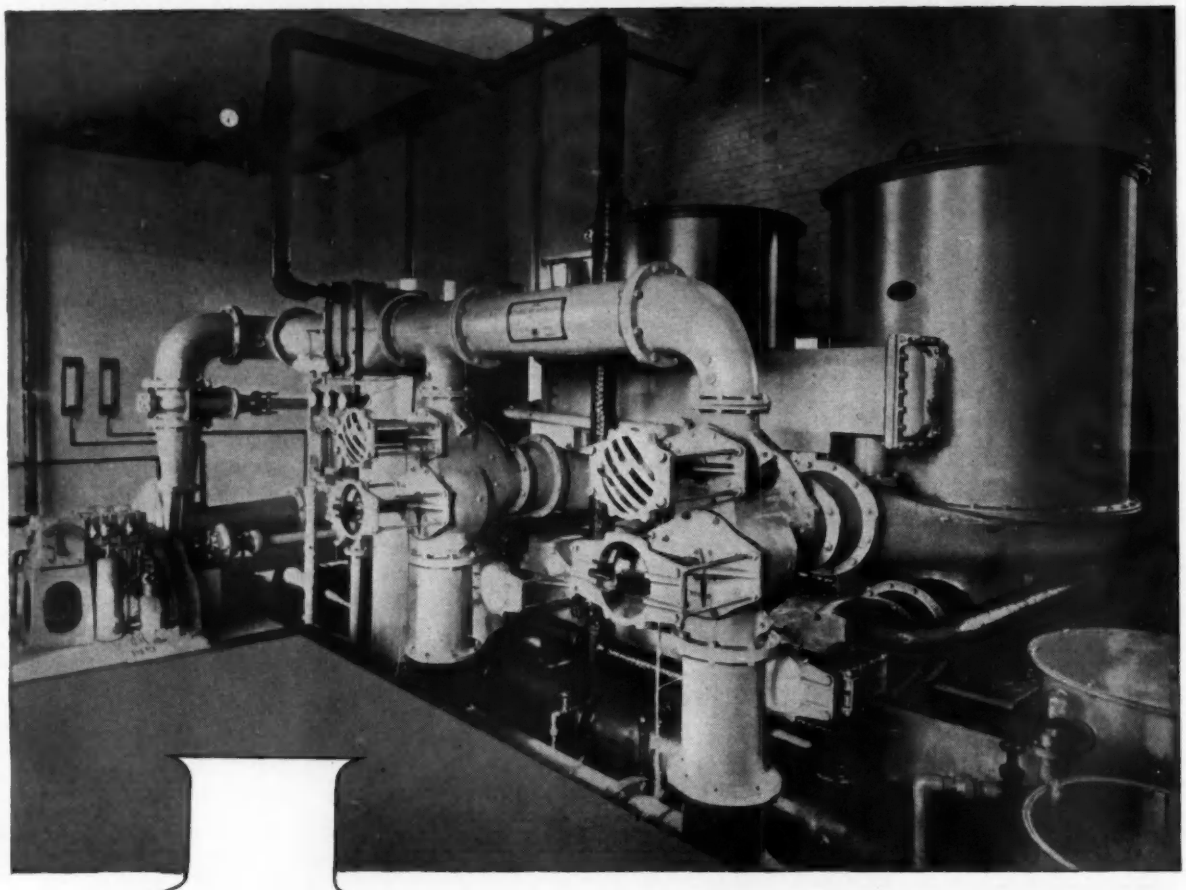

100% recovery of Benzole

HAS BEEN RECORDED

100% recovery of Benzole has been recorded in the Gas Industry where Sutcliffe Speakman plants of the type illustrated are already installed.

These recovery plants are the result of over twenty years' experience in the manufacture and industrial use of Active Carbon. Their capacities range from 250,000 cu. ft. per day. Entirely automatic and with few moving parts, they are compact, clean in operation, and economical to run. Their initial cost, too, compares favourably with that of other recovery systems. In every way they are the most profitable investments. We are always ready to draw up a complete balance sheet for Benzole recovery in any specific undertaking of the Gas Industry.

to cut Benzole wastage to a minimum, consult

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Of the 18 Companies which form the *John Thompson Group*, eleven are engaged in the design and construction of plant for the generation of *steam;* the other seven Companies supply highly specialised plant, equipment, or components of such plant and equipment for one or another of the basic industries. The products of the *Group* include all types of steam generating units; much of the ancillary plant and equipment for such installations; storage and pressure vessels in mild steel and alloy steels; pickling, galvanising and acid recovery plant; annealing covers; steel chimneys; motor and industrial pressings; metal windows; industrial flooring; mild steel gas mains and piping; iron castings; instruments for measuring liquids and gases, etc. The activities of this *Group of Companies* are spread over a total area of ground exceeding 100 acres which is occupied by factories and offices situated in Wolverhampton, Bilston, Dudley, Leeds and Glasgow, and the *Group* has Companies overseas in Australia, South Africa, India, Brazil and in New York, U.S.A.

Primarily, The John Thompson Conveyor Company manufactures coal and ash handling plant for boiler house installations, but the Company also manufactures a variety of special purpose Conveyors and a number of portable Conveyors.

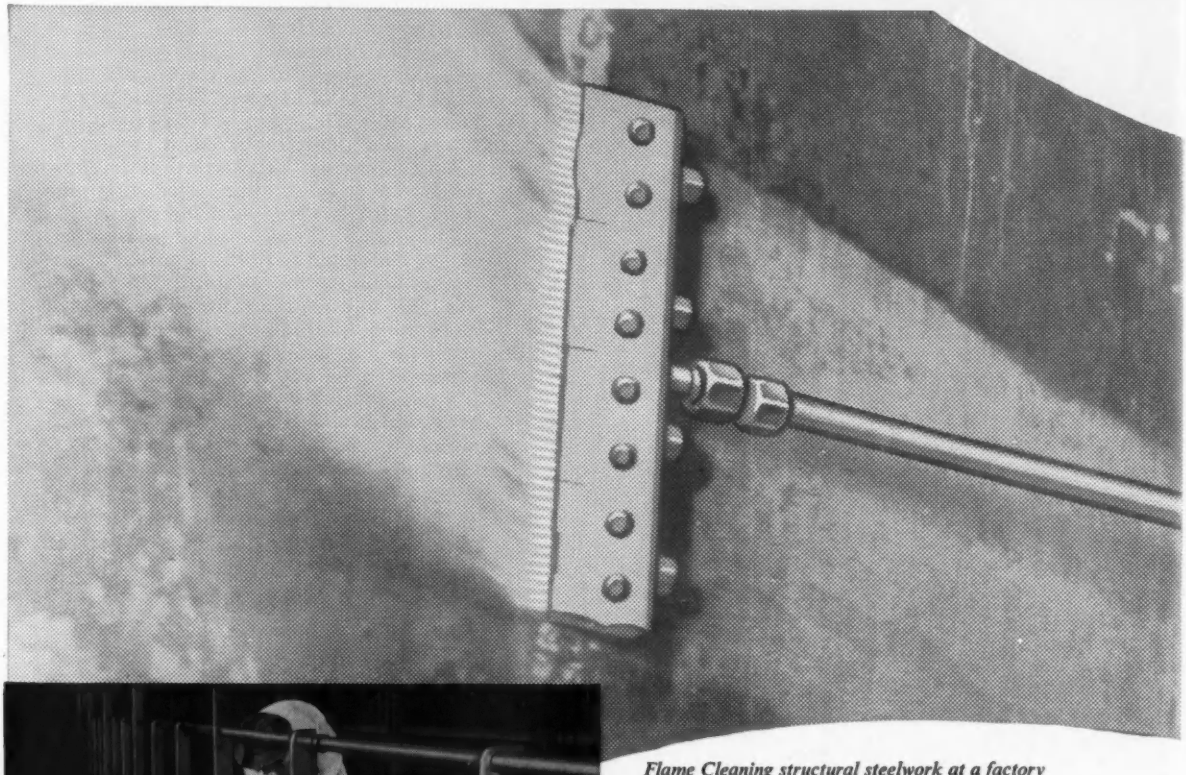
To bring coal to the boiler, the Company designs and constructs Coal Conveyors ranging in capacity from 1 ton up to 45 tons per hour. The removal of the residual ash is provided for by Ash Conveyors of the submerged-belt-type, with belts varying from 24″ — 48″ and in Conveyor lengths up to 250 feet.

A full description of this Company's products and services is given in illustrated literature which will be sent on request to interested firms and engineers.

JOHN THOMPSON CONVEYOR COMPANY
JOHN THOMPSON GROUP

JOHN THOMPSON CONVEYOR COMPANY WOLVERHAMPTON

B.O.C Flame Cleaning strips



Flame Cleaning structural steelwork at a factory where corrosive atmosphere has destroyed the paint coat and caused heavy rusting of the steel.

The B.O.C Flame Cleaning process does the work fast, and does it well. With a steady sweep of the Flame Brush the toughest scale falls clear, and rust becomes harmless oxide dust in a few seconds. On the clean, warm surface thus provided, paint bonds perfectly—which means far longer protection and a big saving in overhaul costs.

Flaws in the metal surface are revealed and can be treated, thus removing all risk of premature corrosion.

Perhaps B.O.C Flame Cleaning can cut maintenance costs in your business, too. Write for a copy of B.O.C Technical Information Bulletin No. IL—it gives all the facts.

scale fast...

BIG AREAS AND TRICKY CORNERS are thoroughly cleaned—a perfect paint-bonding surface left

Shown above and below are detail photographs of the work before and after Flame Cleaning. Note the clean, smooth surface—on which paint bonds perfectly.

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LONDON AND BRANCHES

J.H.C ALUMINIUM SERVICE GOVERNORS

JEAVONS

★ Incorporating the latest improvements in Governor Technique.
★ Designed for moderate gas loads—for larger capacities specify J.46.
★ Compensated against inlet pressure fluctuations.
★ Immediate delivery.

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Whatever the Specification and whatever the Service, Diameter, Length, Pressure, Temperature, Height or Depth, William Press & Son undertake Pipework installations anywhere. Expert and personal attention given immediately on request.

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WEATHERILL HYDRAULIC

The fastest and most dependable loading shovel yet

YOU'RE paying too much to handle bulk materials if you're using anything but a 'Weatherill', for nothing can touch it for speed and downright dependability.

Here are some loading figures that prove its outstanding merit: 10 tons of small coal in 6 minutes; 7 tons of coal dust in 6 minutes; 3.1 tons of coke in 2 minutes. If you can't match these figures and keep them up continuously, then you're throwing money away.

The Weatherill Hydraulic is up-to-date in conception and engineered by specialists with many years' intimate experience of loading shovel technique. It incorporates every feature that has been proved vital to performance, efficiency and economy of operation.

Send for fully descriptive and illustrated leaflet and ask for a demonstration without obligation.

Digger teeth optional.

- **Specially designed for Maximum Penetration.**
- **Hydraulic Power for all-round Efficiency and Simple and Inexpensive Maintenance.**
- **Low Headroom but High Discharge for Manoeuvrability and Loading Versatility.**
- **Finger-tip Control means Less Driver Fatigue and Sustained Speed in Working.**

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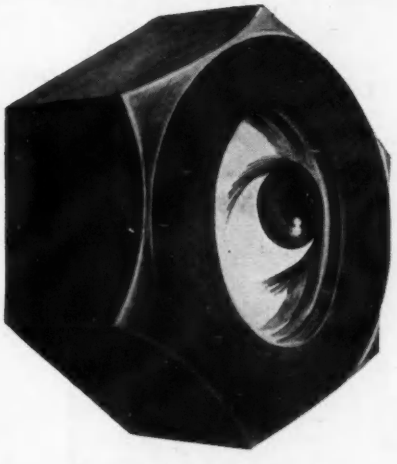

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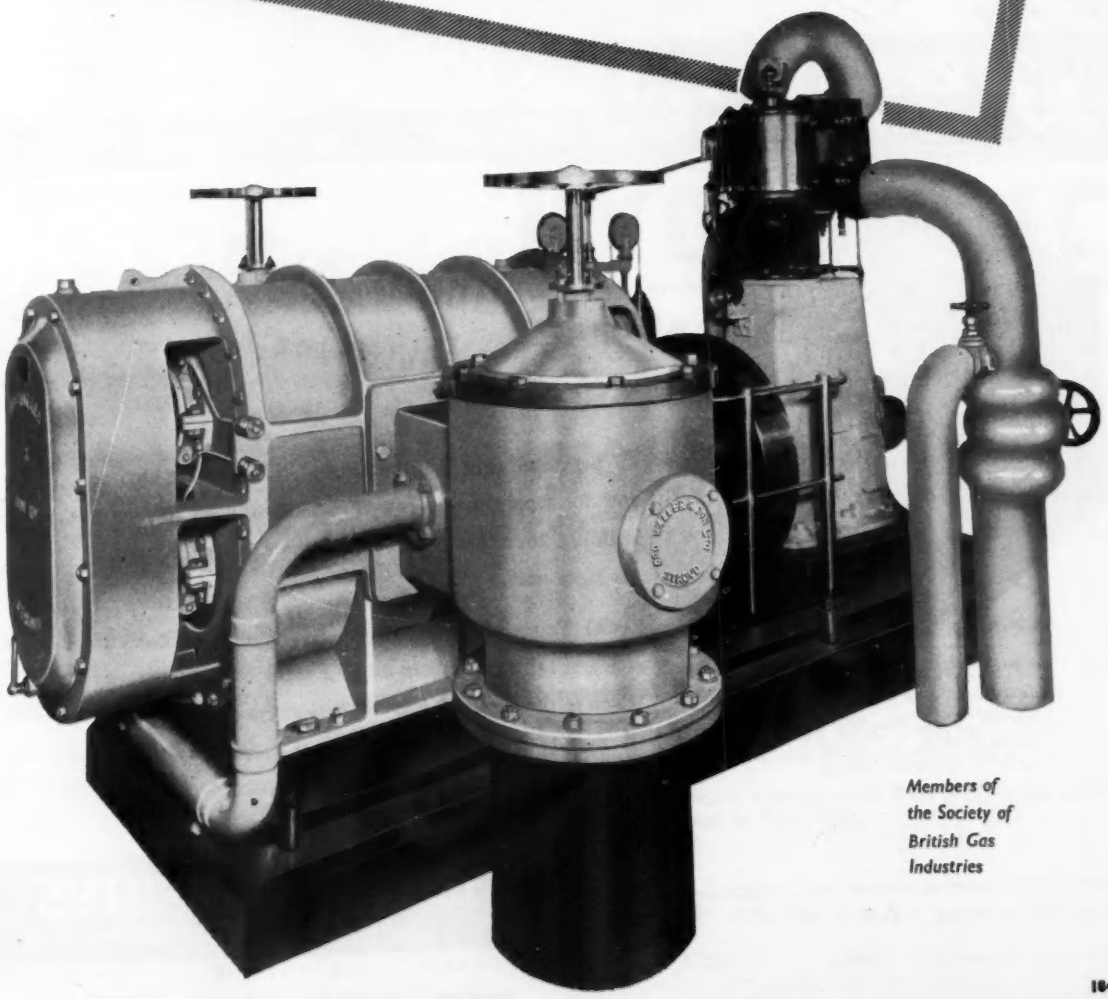

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18409

One of a series of advertisements dealing with fundamental features of the

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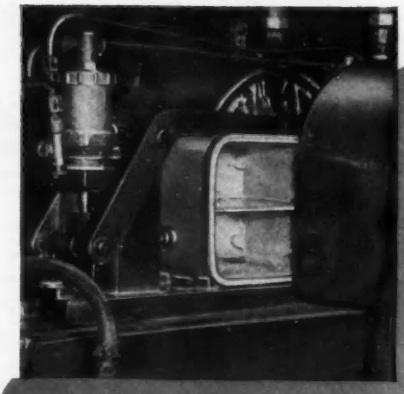
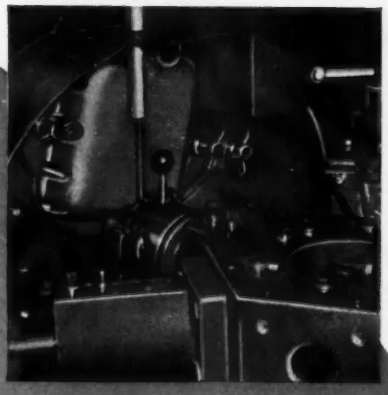
ALL SEALING SURFACES are machined to very close limits for dimensional control and finish. The illustration shows both top and bottom surfaces of the body casting being machined in one pass.

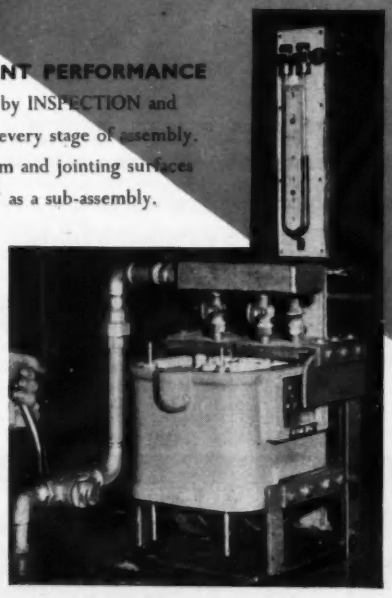


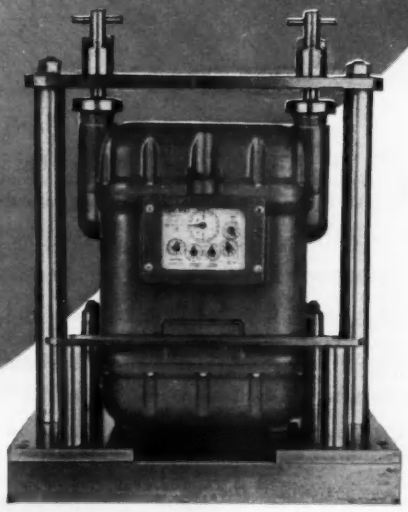
BOSSES are formed and machined from the solid casting, so ensuring the UTMOST RIGIDITY IN DESIGN and the close control of thread dimensions and centres.



P R E C I S I O N

CONSISTANT PERFORMANCE is controlled by INSPECTION and TESTING at every stage of assembly. The diaphragm and jointing surfaces are 'sounded' as a sub-assembly.





FINAL GAUGING in a universal receiver ensures that overall dimensional accuracy is maintained.

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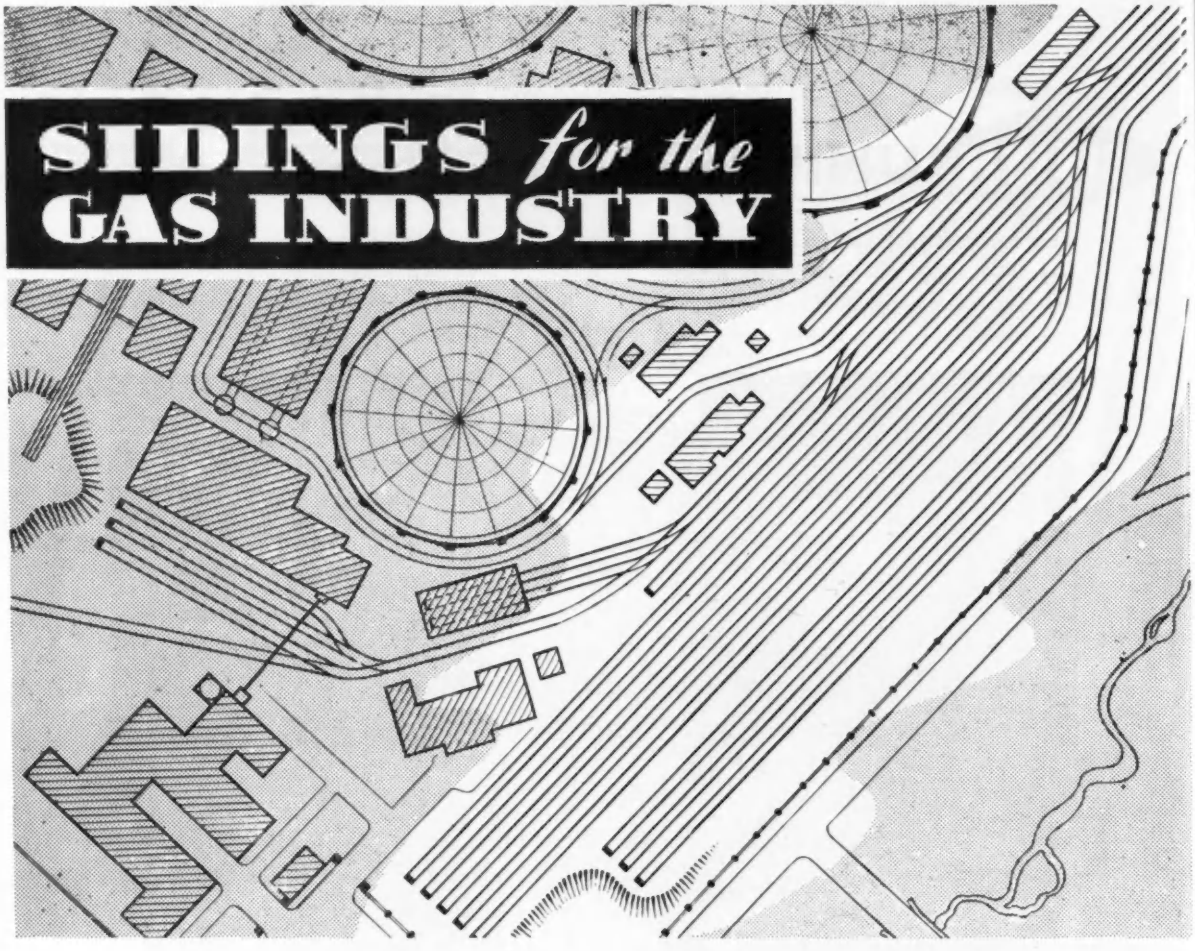
SMITH METERS LTD. 186 Kennington Park Rd., London, S.E.11. Phone: RELiance 2447-8-9. Grams: Smieters, Lamb, London
Works: Kennington, S.E.11 and Streatham Vale, S.W.16. Northern Sales Office: 3-4 East Parade, Leeds, 1. Phone: 23726

SIDINGS *for the* GAS INDUSTRY



IN THE CONSTRUCTION of big sidings for major installations, or in the laying of a simple run-in for a small undertaking, Wards bring to the subject more than half a century's experience. Furthermore, because Wards' planned siding construction combines sound railway technique with this wide experience of operating conditions, there is a technical excellence about a Ward-built siding which makes for low operating costs and minimum maintenance charges.

These are all points of primary importance to those concerned with the operation of railway sidings for the gas industry and other public services.

Those who are concerned with the operation and maintenance of private railway sidings will find much useful information in the second edition of our booklet "Rails and Rail Accessories." Copies will be forwarded on request.

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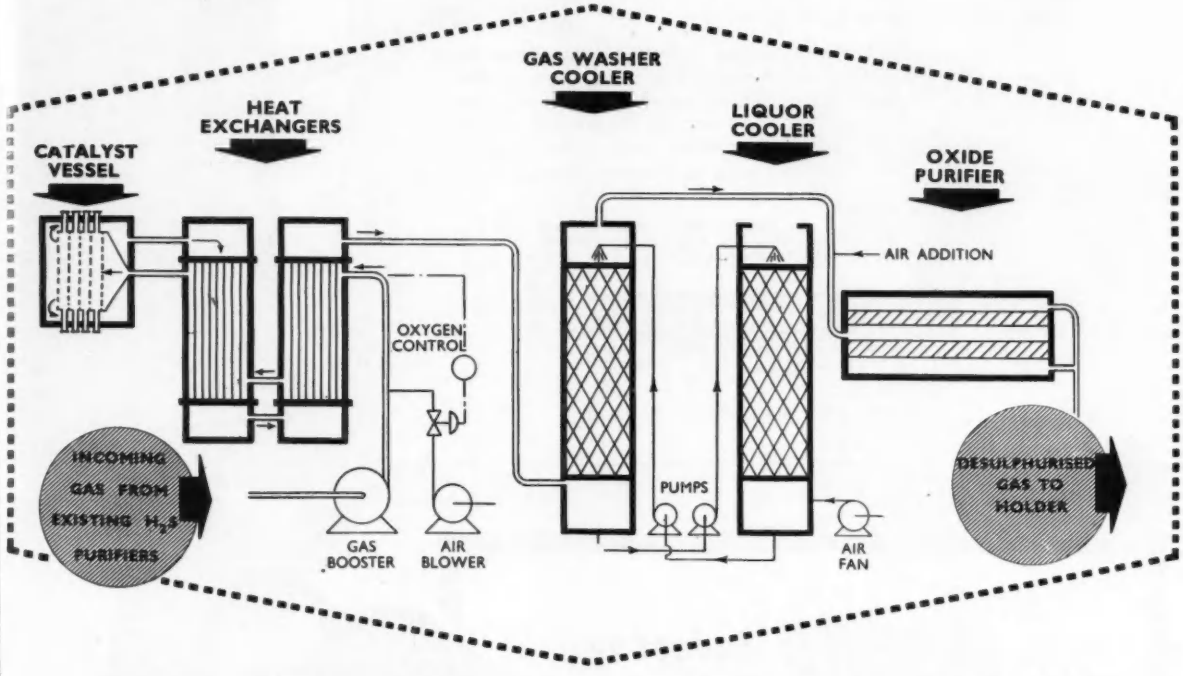
SC. 2

The Railway Siding Consultants and Contractors

The removal of Organic Sulphur from Town Gas

WHESSOE LTD have been appointed licensees by the North Thames Gas Board for their catalytic process for the removal of organic sulphur compounds from town gas.



The advisability of reducing the organic sulphur content of town gas has long been stressed in Institution of Gas Engineers' Communications, the first in 1936, and in the Heyworth Report on the Gas Industry. Gas of low sulphur content would reduce corrosion of domestic water heating appliances, extend the field of use of flueless heaters, and remove difficulties met in special furnace applications, such as scaling in heat treatment, and bloom in glass finishing.

The North Thames Gas Board's process has been developed from the pilot plant at Fulham, to the first works scale plant of capacity 1.5 million cu. ft./day at Harrow. This plant, which has operated since 1938, has demonstrated the success and reliability of the process, which will reduce the organic sulphur content of town gas to below the recommended limit of 10 grains/100 cu. ft. without recourse to benzole extraction, or to 3-5 grains/100 cu. ft. in conjunction with a benzole plant.

Organic sulphur compounds are oxidised at 380°C. by means of the Nickel Sub-sulphide catalyst. Heat loss is minimised by lagging and by heat exchange between outgoing and incoming gas and the small heat requirement is supplied by catalytic combustion of hydrogen and oxygen, the oxygen content being controlled at 0.8—1.0%

The gas is finally cooled and scrubbed free from oxides of sulphur, the alkaline scrubbing solution being cooled and recirculated. A catch purifier is required to remove traces of hydrogen sulphide.

The process is covered by B.P.489,398 and subsequent patents.

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LIMITED

DARLINGTON & LONDON
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PROTECTION

IN Chemical Works, Gas Works, Refrigerating plants, etc., the necessity for dealing with gas escapes and repair work calls for efficient protection of the men on the job. This is provided, in low concentrations of gas, by the "PURETHA" Respirator, which is comfortable, efficient and simple. Its canisters are coloured according to the gas or group of gases against which they give protection. Full mask and mouthpiece, nose-clip and goggles types.

For protection in confined spaces and high concentrations of gas, the company's well-known types of oxygen and compressed air self contained Breathing Apparatus are available. All other protective devices for the worker are also manufactured and supplied: Smoke helmets, short distance fresh air apparatus, resuscitating apparatus, dust masks, protective clothing, goggles, etc.

DIVING APPARATUS, BREATHING APPARATUS OF ALL TYPES, RESUSCITATING APPARATUS AND ALL INDUSTRIAL SAFETY APPLIANCES

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fixing devices every year

Underground fixings or heavy pithead plant—they're all fixed safely and speedily with Rawlplug Fixing Devices. If you have a fixing problem write to our Technical Service Department.

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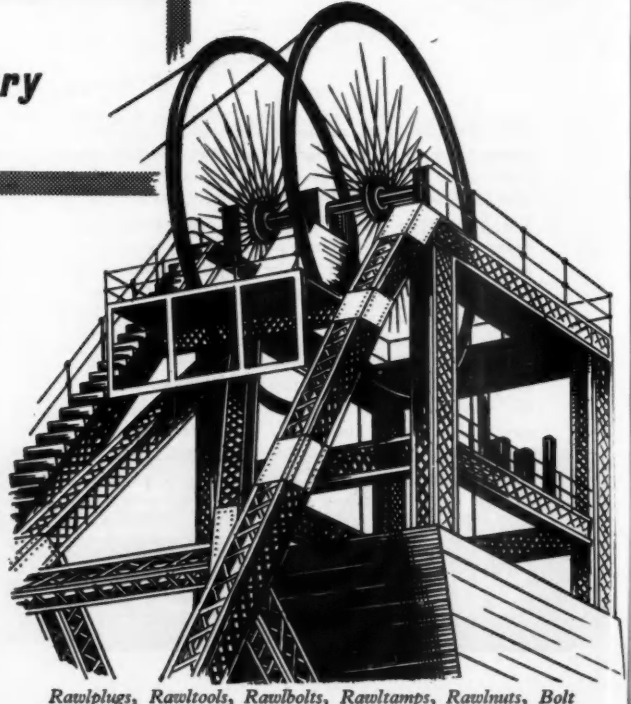
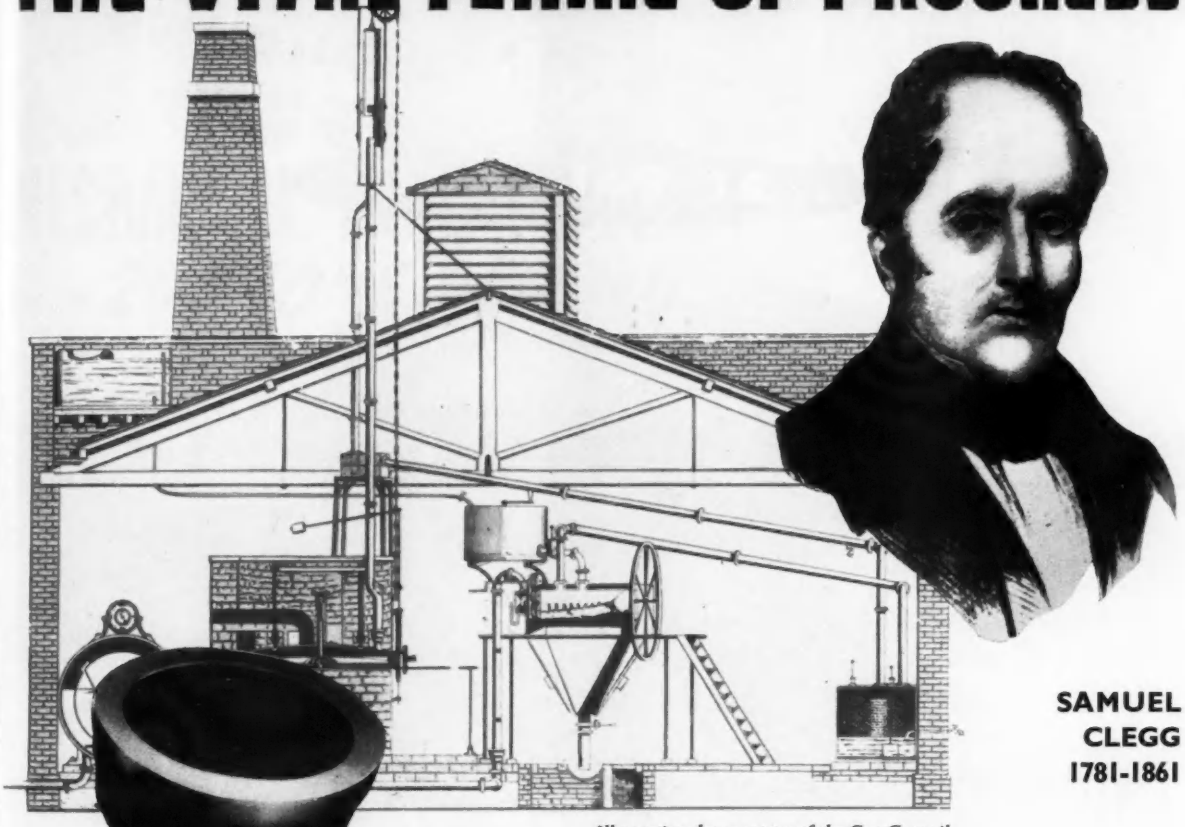


Rawlplugs, Rawltools, Rawlbolts, Rawltamps, Rawlnuts, Bolt Anchors, Screw Anchors, White Bronze Plugs, Rawltoggles, Rawlclips, Cement in Sockets, Durium Drills and Hole Boring Tools for Hand, Electric Hammer or Pneumatic Hammer operation.

THE VITAL FLAME OF PROGRESS



SAMUEL CLEGG 1781-1861

Illustrations by courtesy of the Gas Council.

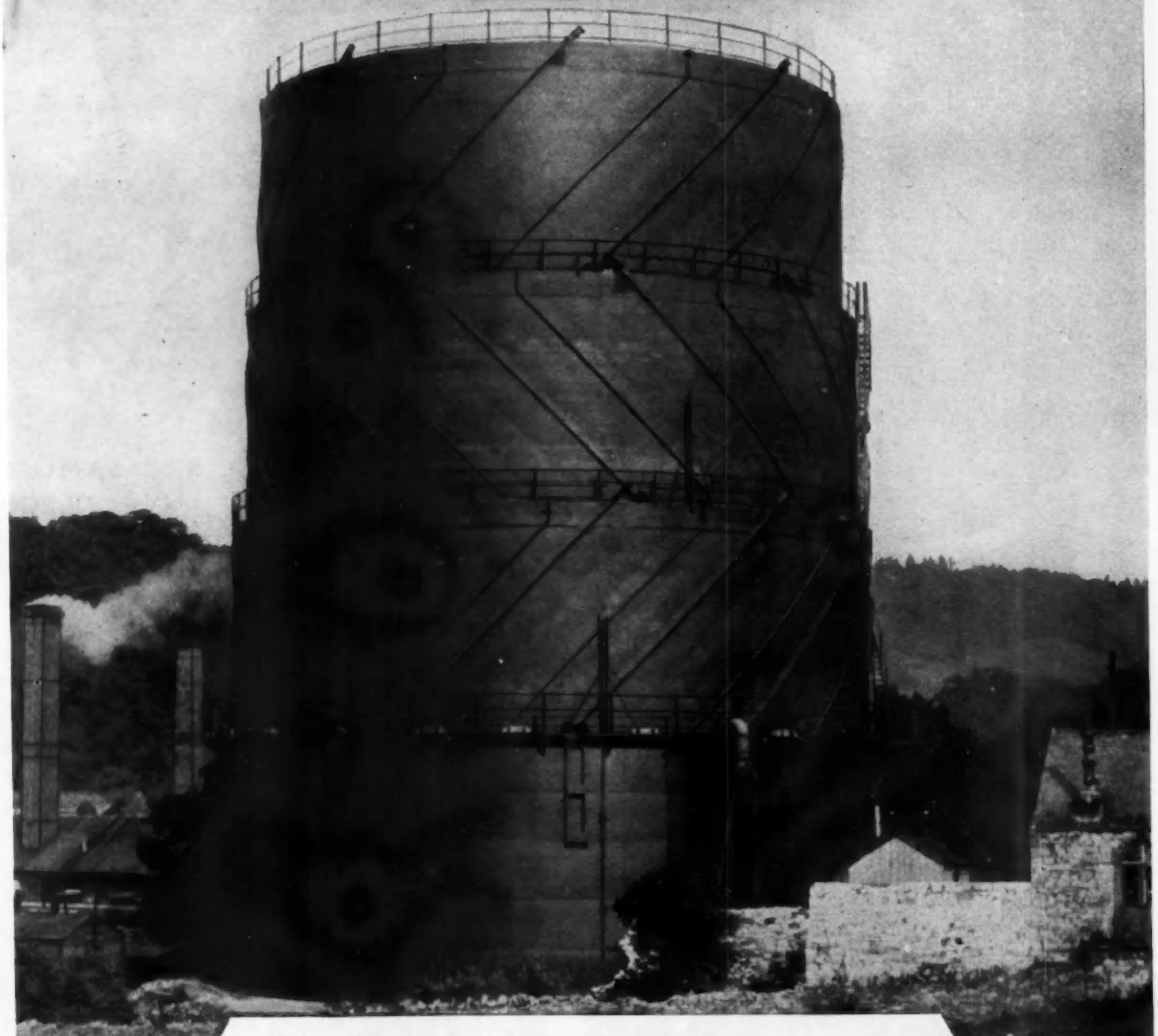
A Mancunian, born in 1781, played an important part in the engineering of early gas plants and particularly of the purification of gas before distribution.

For many years Staveley pipes have been recognised the world over as of the highest attainable standard for Gas mains.

SAND & METAL SPUN PIPES FOR GAS

THE STAVELEY IRON & CHEMICAL CO. LTD. NR. CHESTERFIELD

A NEW OXLEY GASHOLDER
...at Bakewell



This all electrically welded Gasholder was recently completed for the East Midlands Gas Board at Bakewell, Derbyshire. It is a three lift spiral guided type in a steel tank. Capacity 250,000 cu. ft. Steel Tank 73′ 0″ dia x 26′ 6″ deep.

Photograph by Courtesy of East Midlands Gas Board

OXLEY ENGINEERING CO. LTD., HUNSLET, LEEDS 10

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W.14

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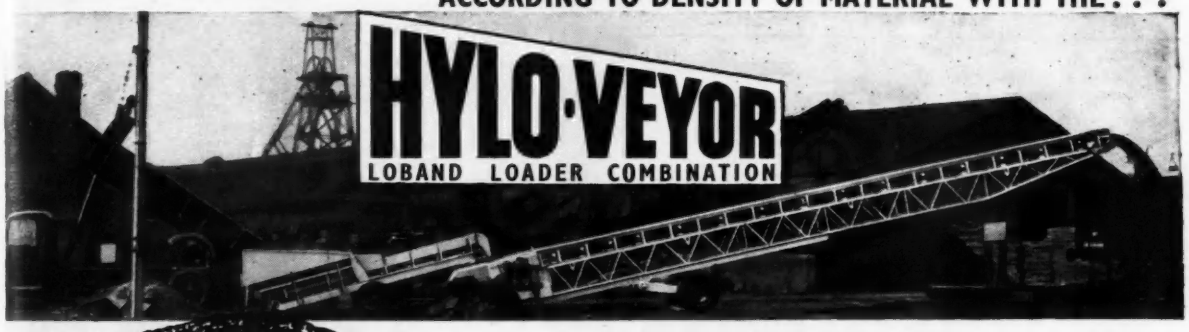
MECHANICAL HANDLING PLANT

UP TO **200 TONS PER HR.**

ACCORDING TO DENSITY OF MATERIAL WITH THE . . .



NO TROUBLESOME CHAINS OR SPROCKETS

VARIABLE ELEVATION THROUGH WIDE RANGE
STOCKPILING UP TO HEIGHTS OF 30FT.
WITHOUT SECOND HANDLING

Illustration shows a 48 ft. centres × 24 in. belt HYLO-VEYOR LOBAND-LOADER COMBINATION transferring washed slack direct from tipping truck to railway waggon at the rate of 150 T.P.H. FIXED CONVEYORS can also be supplied. Power units can be electric motor, petrol or Diesel engine. Please apply for our new General Conveyor Folder. CF/43

WE MANUFACTURE PORTABLE CONVEYORS from 20FT. to 62FT. CENTRES GIVING DISCHARGE HEIGHTS UP TO 30FT.

'M.A.' type CONVEYOR

A LARGE RANGE DISCHARGE HEIGHT TYPE WITH HYDRAULIC JACKING.

This highly mobile and robust machine is available in 30 ft. and 36 ft. centres giving variable elevations from 7 ft. 3 in. to 15 ft. 6 in. and 7 ft. 10 in. to 18 ft. respectively. Electric motor, Petrol or Diesel engine drive.

CAPACITIES *up to*
120 TONS PER HOUR
***on materials at* 50 lbs per cu. ft.**
This Conveyor can be used in conjunction with the Loband Loader.

C.H.JOHNSON (Machinery) LTD., CF/43 **ADSWOOD, STOCKPORT, Ches.**
PHONE: STO 2642/5 GRAMS: 'Machinery' Stockport Also at LONDON (Prospect 7671) GLASGOW (Kilmacolm 558).

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Write for particulars of how E. B. Service can help in reducing maintenance costs. Manufacturers of all types of Cements.

E. B. REFRACTORY CEMENT CO. LTD.
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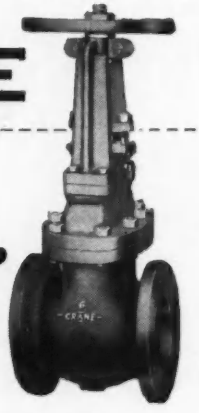
VALVES
for Gas, Steam,
Water, Oil
and Air

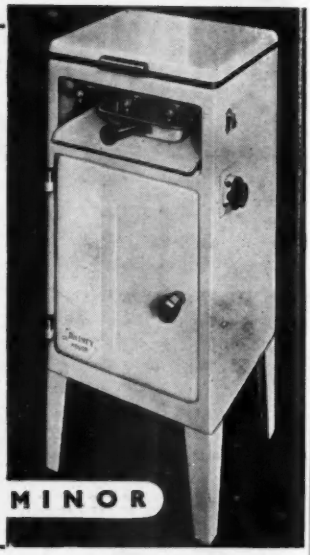


BIG Capacity for LITTLE Kitchens

Especially suited to the kitchens of flats and small houses, this highly efficient cooker provides utmost cooking capacity in the least possible space. Cast iron construction ensures strength and durability and reduces maintenance costs to a minimum, thus making the Dainty Minor particularly suitable for simple hire or hire purchase.

Approved and adopted by leading gas boards

The Dainty MINOR



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CIVIL ENGINEERING · REINFORCED CONCRETE AND BUILDING CONSTRUCTION

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Entrust this important part of your expansion programme to this organisation which has been responsible for the construction of many major projects at home and overseas.

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117/65.

AH! THAT REMINDS ME

The bursting of a button is an easy thing to do, especially when doing a job of work. It reminds me of the "Pop" system of riveting, because it's as easy—and as quick too. Just one movement of the Tucker Riveting Gun and the rivets go home easily, speedily and securely, into places almost inaccessible by other methods.

"Pop" riveting is the modern way of riveting, enabling riveting from one side of the work piece only . . . with safety, security and speed.

"POP" is a registered Trade Mark of the manufacturers

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ONE OPERATOR OPERATION

CONSULTANTS & TOOL MANUFACTURERS
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THE MODERN SYSTEM OF RIVETING

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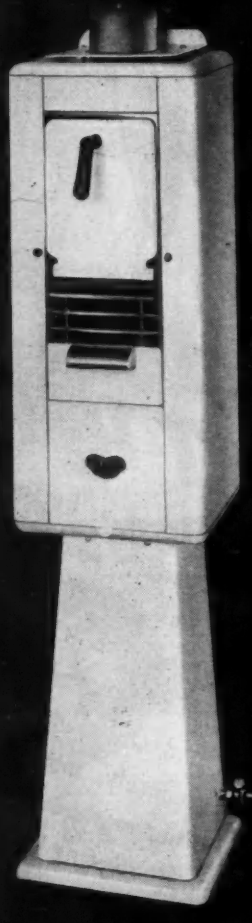

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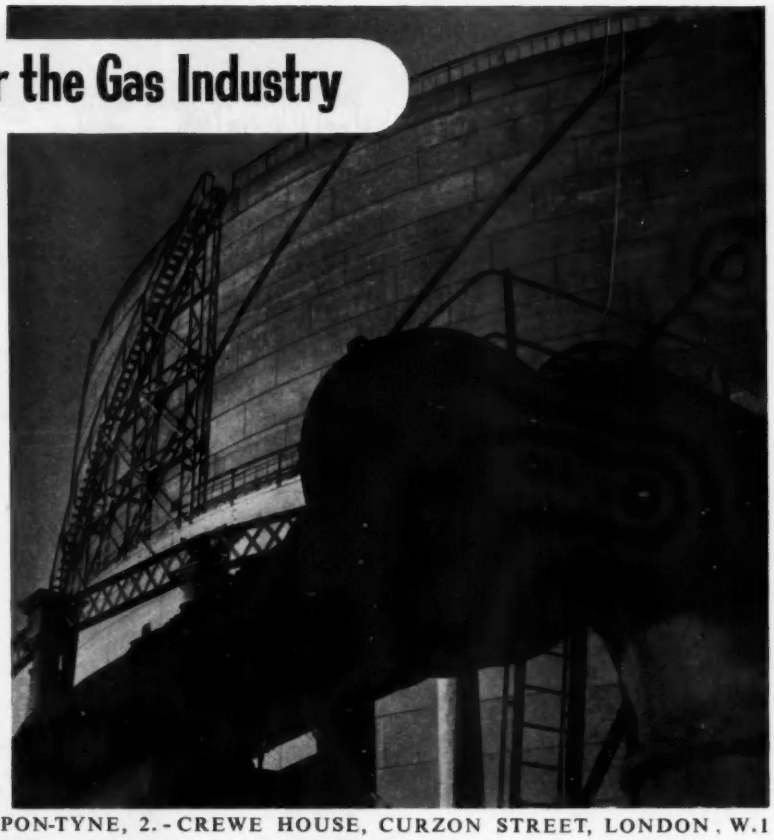

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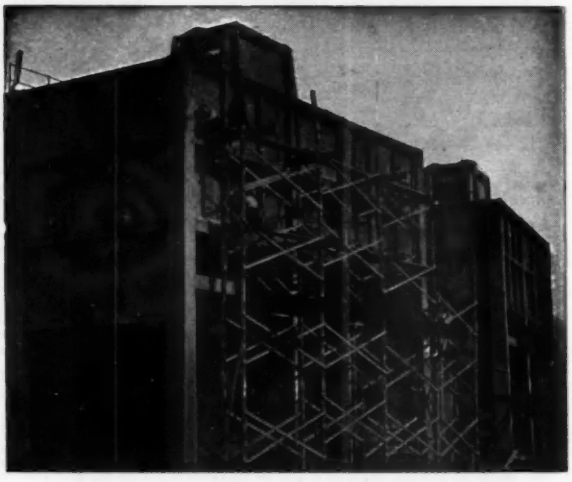

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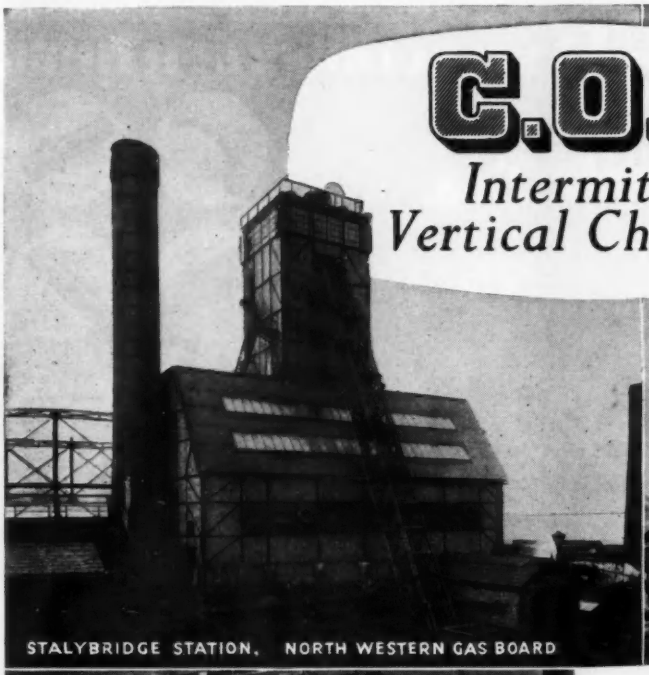

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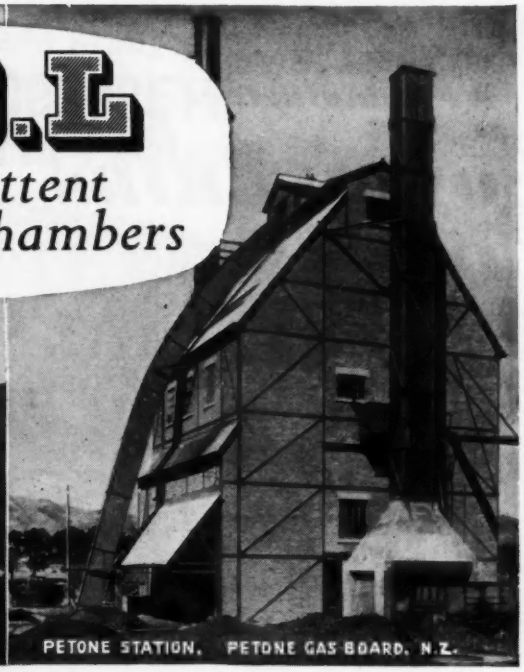

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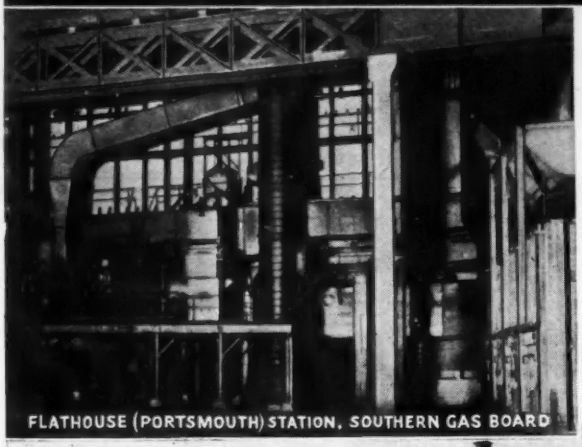

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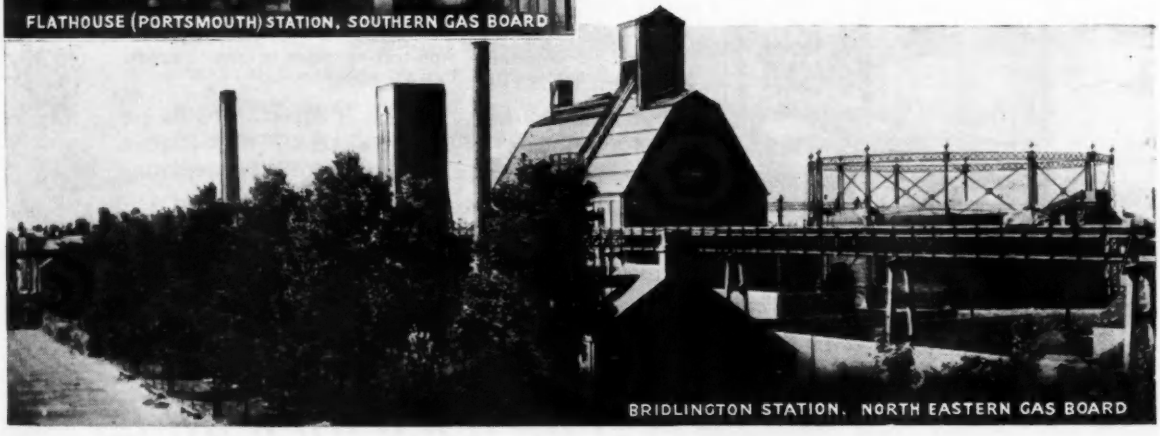

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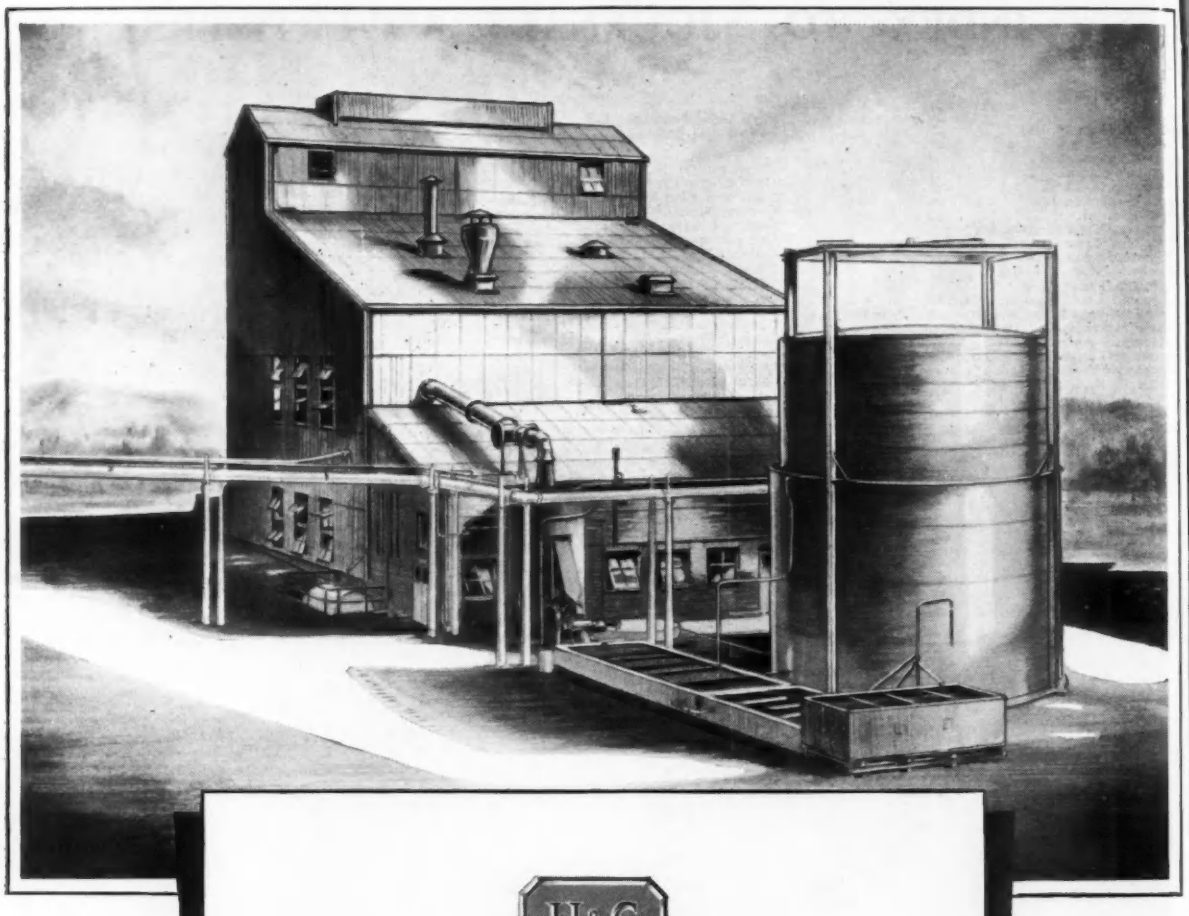

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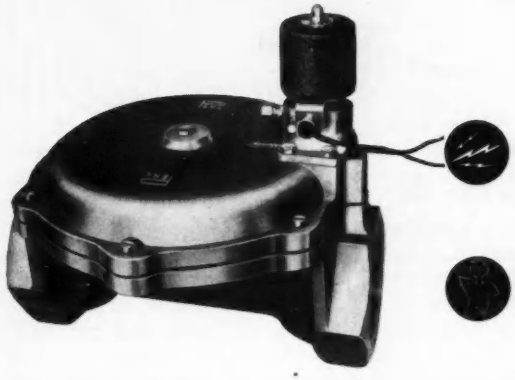

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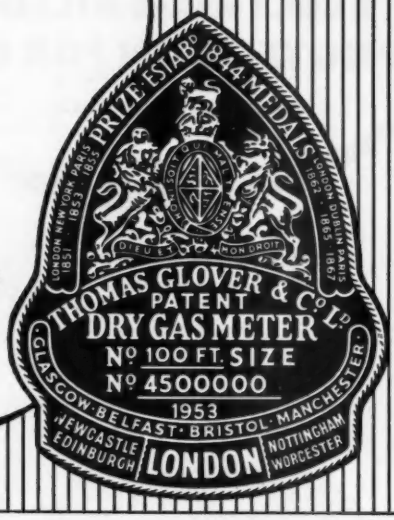

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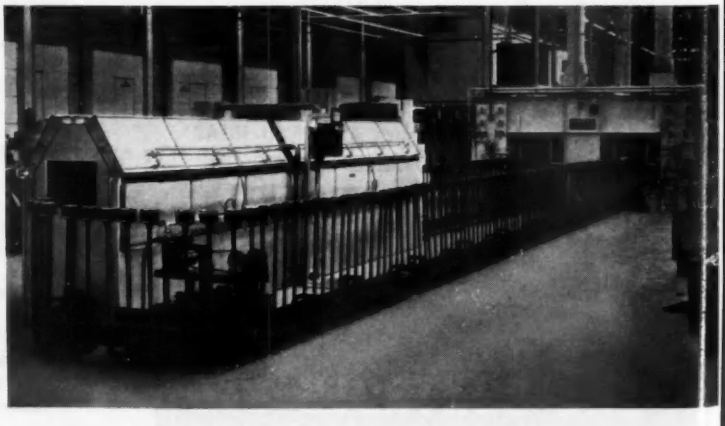

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Gas Journal

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CAUSE AND EFFECT

Whatever changes take place in our national life, those changes are mirrored in the commercial policy of the gas industry—and, indeed, of many other industries. Changing apparently in sympathy, but in fact of necessity, the sales policy must always be so framed as to permit sales at economic prices. This relationship between national events and changing tastes on the one hand, and commercial policy and practice on the other, is a fascinating subject for study and has excited the attention of several authors of papers to gas associations. The latest convert is Mr. G. H. W. Madge, Western Divisional Manager of the North Thames Gas Board, who devoted the whole of a paper to this particular form of cause and effect at a meeting of the London and Southern Section of the Institution of Gas Engineers last week. He gave it the somewhat clumsy title of 'Suiting Our Times. A Commercial Opinion' and divided it into three 'pictures' showing respectively the pre-war situation, the post-war situation, and the future. The first two sections were well constructed and of considerable interest, but unfortunately the author's crystal ball to which he later turned was more than a little cloudy. It is a fact as undeniable as it is regrettable that as an industry we have a sad dearth of distinguished prophets.

Mr. Madge is, of course, a Gas Light man and it was hardly surprising that his comments were rich in Gas Light influence. Indeed, his account of the stirring growth of sales development before the war could not have had a better foundation, for it would be difficult to deny the importance of the pioneering work carried out under G.L.C. guidance in that now curiously distant period. That the period was a significant one is equally indisputable. Urged on by Sir Francis Goodenough, the gas industry was becoming aware of the fact that production and selling were complementary to each other and that the product, no matter how excellent, could not be relied upon to sell itself. This realisation was furthered by the rapid growth of the electrical industry which was fast putting its production house in order and, having developed an effective grid system, was looking about hungrily for new loads to swallow, such as the domestic cooking load.

To combat this threat the progressive gas undertakings increased their sales forces and, in the case of the Gas Light in particular, auxiliary salesmen were won to the ranks by commission schemes for all employees and for authorised dealers, as well as for the regular selling staff. Large-scale schemes were put into operation and the public was wooed by extensive advertising, hire purchase, and vastly improved appliances. Paramount among the latter was the vitreous enamelled cooker for the slot meter consumer, that 'poor relation' who was now for the first time regarded as a valuable prospect. There emerged the gas refrigerator (family size for half-a-crown a week over five years), the instantaneous sink heater, and the slow recovery storage water heater, the gas-ignited coke grate, and the greatly improved fixed and portable gas fires.

There were, of course, snags—there always are. The widely advertised five years maintenance guarantee covering the maximum hire purchase term had sales appeal but was extraordinarily costly. The practice of giving regular inspections, a large proportion of them to prepayment consumers, irrespective of the ownership of the appliance, was of course good service by any standard but, comments Mr. Madge, 'it is questionable whether some of it was necessary even with the rather different gas appliances of those days.' During this period issues of gas appliances were very large, but returns of appliances were proportionately even larger, and over-selling became an evil in the land. Mr. Madge points out that, in view of the size of the net appliance issue figure before the war, it is surprising that gas consumption increased so slowly (in fact it showed a tendency to drop slightly); but he maintains, rightly no doubt, that but for the tremendous sales effort made the consumption picture would have been still less satisfactory. As at the present time, more modern appliances used less gas than those which they replaced.

THE POST-WAR PICTURE

After the war, in the welter of difficulties and frustrations, there emerged first the determination to press on speedily with the long-overdue reconstruction of works, itself an immensely difficult task. Conditions became vastly different. Coal and labour costs had risen and a greatly increased proportion of the cost of gas had to be debited to manufacture. After the work of reconstruction came that of research. There were new and urgent fields to be explored such as the production of improved solid fuel grates, new cooker designs, and industrial applications. Training and rehabilitation courses got under way.

In the Gas Light and Coke Company certain organisational changes had taken place. The term 'salesman'

had been replaced by 'representative' and the district representative dealt with all except specialist enquiries. Commission schemes which had lapsed were not re-introduced because of appliance shortages. Decentralisation had been carried a step further and responsibility for gas utilisation became concentrated within the territorial divisions which continued to act as agents for the Coke Department and to draw on the services of specialists from the newly formed Headquarters division, lineal successor of the old Special Services Section. (It is perhaps significant that the organisation of the G.L.C. was so far ahead of its time that Mr. Madge, who deals faithfully with all other changes, does not deem it necessary to mention the advent of nationalisation.)

A standard charge for a minimum gas carcass was introduced for local authority building; and although this has since been raised by agreement, it has resulted in provision being made for gas in practically every new dwelling in the Board's area—a fine achievement. The post-war simplification of the two-part tariff was accompanied by the introduction of a new housing tariff designed to give tenants of new dwellings the advantage of lowered administrative costs arising from landlord's collection of the standing charge.

So successful was the drive to eradicate black cookers that there are now fewer than 50,000 left in the Board's area. One of the factors which probably contributed to this success was the evolution of the 'London' cooker. It is interesting to note that the net issue of cookers has been greater in the post-war period than in the corresponding pre-war period, despite the very large amount of exchange business. Mr. Madge comments that the current rate of issue of enamelled cookers represents on an average an exchange about every 15 years.

In the three years 1950-52, there has been an average net annual issue of about 90,000 major gas appliances, which is more than half the pre-war figure, notwithstanding current shortages and restrictions. Only in the cooking field has the percentage of exchange of appliances been really pronounced, but this is in conformity with the Board's policy of progressive modernisation. The paper reveals that, despite the more restricted sales campaign undertaken since the war, not only has the average gas consumption for all consumers increased appreciably, but consumption per domestic consumer has risen substantially due to an increase of 30% in the consumption of the average prepayment consumer. At first, says Mr. Madge, this appears to contradict the case for increasing appliance sales as the best means of increasing gas consumption. But he believes that the new business gained since the war has been more profitable than the pre-war business, due to the post-war shortage of solid fuel and the rise in the standard of living of the manual workers who largely constitute the prepayment consumers. He maintains that the thousands of gas appliances installed for prepayment consumers before the war which still survive are working much harder in their old age than in their youth. Moreover, he has a theory that much of the increased gas consumption is for space heating. If this view is correct, it behoves us to consider whether the high annual consumption now being registered by the average prepayment consumer is likely to continue. 'May there not be a danger that when solid fuel becomes more readily available, our prepayment consumers will not be so inclined to light up the gas cooker whenever the weather turns cold?'

As a survey of commercial development and adaptation in a highly progressive undertaking, Mr. Madge's paper has much to commend it. Readers whose appetites may have been whetted by this comment on some of its key points are advised to read the full version, and the report of the discussion which followed its presentation, in the April issue of 'GAS SERVICE.'

SCIENCE IN INDUSTRY

The results of an important investigation carried out by the Manchester Joint Research Council, covering a large section of one of the most industrialised areas in the country, have just been published by the Manchester University Press under the title 'Industry and Science.' The price of the book, which shatters many illusions held about British industry, is 12s. 6d., and it is good value for money. After an examination of some 500 industrial establishments of 225 firms in Greater Manchester covering a great variety of trades, the Council states quite firmly that there are no grounds for the notion that there is one cause and one solution for what is commonly called the problem of science and industry. If the investigation has done nothing else, the report comments, 'it has surely demonstrated that generalisations covering the whole field of British industry regarding the use which is, or should be, made of scientists and technologists may be wholly unjustified.' The investigation does much more. It reveals a striking use of scientific knowledge in industry. It finds no evidence that scientists are wastefully employed in industry. It shows more contacts between industry and the universities than might have been suspected. And it concludes that 'in certain fields of British industry the resources of science are most effectively enlisted to aid and support industrial progress.' On the other hand, the investigators did find that too few scientists were employed. Of the firms needing to use scientific personnel, 42% were understaffed—and one-third of them did not realise it. There appears to be considerable scope, too, for employing more scientifically trained men on process control and the improvement of production efficiency, as opposed to development and research.

We should perhaps explain that the Manchester Joint Research Council was formed in 1944 as a co-operative effort between the University and the Manchester Chamber of Commerce. The idea of this enquiry gradually developed during 1948 and 1949 and was given emphatic encouragement by the then Lord President of the Council, Mr. Herbert Morrison. Work began towards the end of 1950. In contrast with previous enquiries into the same topic it was decided to take a typical cross-section of industry and to concentrate on firms with more than 50 on their pay-roll and to exclude companies with country-wide establishments. The report quickly gets to the heart of the matter; and one of the revealing finds of the investigation came from an analysis of the posts held by university graduates. Out of a total of 684 graduates, as many as 93, or 13.6%, were directors. These were spread over 73 of the 99 firms known to be employing graduates. The implication of these facts is significant. Scientific knowledge at board level is thought important in a high proportion of those firms employing graduates, and in these firms a certain measure of policy direction is in the hands of

scientifically trained men. They are also encouraging for science graduates thinking seriously of taking up an industrial career.

IMPACT OF SUPPLY AND DEMAND

This, however, brings us back to what we recently emphasised in these columns and what is without question a matter of grave concern—and that is the serious dearth of graduates entering the schools to teach science and mathematics. This does, in fact, constitute a national problem. Unless enough men and women with suitable abilities and qualifications come forward to teach in schools, there are bound to be serious long-term effects both on the general quality of education of the nation and on the future supply of scientists and technologists. Today industry is taking at least one-third of men graduates at first degree level. Industrial demand is strong—and financial prospects are not unnaturally a main factor in the situation. Of course, science graduates need much more than academic training to succeed in industry. And it does seem to us psychologically peculiar to find that, in no case covered in the survey on which we are briefly commenting, had a man employed solely on research been appointed a director of a company. As indicated in the foregoing, the investigation was limited in its range; and maybe the Mancunian outlook—wide, long, and deep as it is—clouded a broader issue of modern thinking. For example, research workers *per se* are to be found in the highest executive positions in the nationalised fuel industries. We could name several. But what we have uppermost in mind is that it is just as necessary to keep up to date the psychological approach to the human mind as it is to be lively in other fields, such as applied medicine, or engineering, or aeronautics. And today we are experiencing the impact of the sluice-gates which have been opened to widespread education—a voluminous flood which calls for filtering of dirt and débris.

We cannot end our comment on this valuable report of the Manchester Joint Research Council without emphasising again the strong implicit impression that too little attention is being given to the service which could be made available, without further ado, in maintaining, or improving, the efficiency of plant and process. It is disheartening to discover within the confines of this honest and readable report that many firms with qualified staff have never bothered to find out the efficiencies of boilers or turbo-generators. One boiler plant, we are told, was being operated without any knowledge of how to make use of the results recorded by the instruments.

Admittedly these were isolated cases. And we entirely agree with the *Manchester Guardian* that, while the general impression left is that British industry has its faults, they are not so glaring as many people would have us believe. The investigators have provided a useful array of statistics. They have, moreover, not been afraid to say what they think even when they have found it difficult to arm themselves with adequate evidence. The Committee's final conclusion speaks for itself: 'One of the clearest convictions this enquiry has left with those most intimately concerned is that more and better liaison and education are needed to a far greater degree than more and better science.'

NEW DUNLOP WORKS IN BRAZIL

Dunlop's new tyre factory in Brazil was officially opened on March 20 by Mr. G. E. Beharrell, Managing Director. The factory, covering some 250,000 sq. ft., stands on a site of 120 acres, seven miles from the city of Campinas, which is 65 miles north-east of Sao Paulo, the capital of the State. A four-lane highway links Campinas with Sao Paulo, the fastest growing city in the world with a population approaching 3 mill., and the commercial and industrial hub of Brazil. Campinas, a growing city 2,500 ft. above sea level, has a dry and healthy climate and was selected because of the availability of services needed in a rubber processing factory. The new venture is a natural consequence of the vigorous development of road transport in Brazil, where the number of vehicles has doubled in the past five years, a process which will continue as the vast road-building programme at present being undertaken is completed.

CONTINUING RESEARCH AT ROCHDALE

In an attempt to determine the mechanism of carbonisation with particular coals in vertical retorts, operated conventionally and also with the new 'Rochdale' process (described in last week's 'JOURNAL,' pp. 665-686), six continuous vertical retorts of the Rochdale installation were quenched by water on March 18. The aim was to 'freeze' the charges as quickly as possible and thereby obtain, when the retorts were dismantled, a picture of the transition from coal through the various stages to coke; the mode of travel of the charge; the structure of the coal and coke mass; the route of the injected and indigenous gas; and the approximate indication of temperature at various points throughout the charge. At the time of quenching, both slack and double-sized grades of coal were being carbonised, both with and without gas injection. The technique used for quenching followed broadly the previous work in this field by Haffner and Weston at two works of the former Gas Light and Coke Company. It is estimated that dismantling of the retorts and the taking of the necessary measurements, tests, and photographs will take some two to three months.

Personal Notes

MR. G. A. HANNAH, Managing Director of Pegson, Ltd., has been appointed Director of the parent Company, Mellor Bromley and Co., Ltd.

MR. RALPH BECK, Photographic Officer to the Gas Council, has been elected to sit on the National Committee set up by the Institute of British Photographers to consider and serve the special interests of industrial staff photographers.

MR. SAMUEL DONALDSON, Consumer Service Superintendent of the Belfast Corporation Gas Department, has retired after 51 years continuous full-time service. He has been granted a retiring allowance with effect from March 1.

MR. ERIC GIBBONS, Technical Director of Gibbons, Ltd., gas furnace engineers, with works at Gornal and Kingswinford, Dudley, is to become Chairman of the Brierley Hill Urban District Council for this year. Councillor Gibbons has been a member of the Council since 1949. During the war he was engaged on the construction of gas plants at explosive factories.

MR. L. J. MORSON has been appointed Birmingham Service Depôt Superintendent for E. Boydell & Co., Ltd., manufacturers of Muir-Hill equipment. Mr. Morson was previously employed by a well-known plant hirer and also served with a large Midland public works contractor in the servicing of plant. In his new capacity he will be responsible for the supervision of field service engineers, and the overhaul of Muir-Hill machines, together with the supply of spare parts, not only in the Birmingham area, but also in South Wales and the South West counties, including Devon and Cornwall.

MR. T. C. FINLAYSON, a graduate of Manchester University, Chairman of the Woodall-Duckham Construction Co., Ltd., was, in company with Mr. Edgar Lustgarden, author, and also widely known to the public through his broadcast activities with the B.B.C., a guest of the London Section of the Old Mancunians' Association recently. Mr. Finlayson, son of a former Governor and Treasurer of the Manchester Grammar School, outlined what industry expects of such a school. And, as recorded in the *Manchester Guardian*, the High Master 'staggered everybody' by revealing that the sixth form now contains 437 boys, of whom 80% will go to a university—'a revolution brought about not by the school, but by the society in which it exists.'

MR. C. J. POPE, of the Wales Gas Board, has been appointed to succeed Mr. T. Wilkinson as Engineer and Manager of the Abercarn Undertaking when he retires on March 31. Mr. Pope, who is 31, commenced his career in the gas industry as an apprentice gas fitter at the then Rhondda Corporation Gas Department in 1938. After five years service with the R.A.F., Mr. Pope completed his apprenticeship, then becoming a part-time student of the Glamorgan College of Mines and Technology, obtaining his Higher Grade Certificate in Gas Engineering (Supply) in 1950. Mr. Pope acted as assistant to the Rhondda Undertaking Distribution Superintendent from May, 1949, to December, 1950, when he was seconded to Headquarters to act as a Technical Assistant to the Board's Distribution Engineer.

Obituary

MR. R. L. HAYNES, Publicity Assistant of R. & A. Main, Ltd., died on March 13 following a short illness.

MR. ERNEST HUTCHINSON, Engineer and Manager of the Worksop Undertaking from 1918 until he retired in 1949, has died at his home at Parkstone, Dorset. Before going to Worksop, Mr. Hutchinson was Engineer and Manager at Ripley, Derbyshire. He served his pupilage with the late Mr. Matt Dunn at Selby.

MR. ARTHUR H. BARKER, who was widely known in heating and ventilating circles, has died at the age of 83. Apprenticed to Henry Berry, Ltd., Hunslet, Leeds, he was for a time assistant to the Profession of Engineering at Leeds University. He later spent 15 years in industry in various capacities, including 10 years in charge of the heating and ventilating department of G. N. Haden & Sons, Trowbridge. Mr. Barker was head of the Department of Heating and Ventilating Engineering at University College, London, for 10 years, and carried out much original research. In 1911 he started as a consulting engineer and later formed the firm of A. H. Barker & Partners, from which he retired shortly before his 80th birthday.

MR. W. D. ELSON, Production Officer to the Gas Council, died on March 16, at the age of 60, after 43 years with the gas industry. He began his career with the Gas Light and Coke Company in 1911 and, after a break of four years' war service, he joined the British Commercial Gas Association in 1921, starting on the administrative side. When the British Gas Council was formed, he was appointed Production Officer, a position he retained on nationalisation of the industry. Widely known throughout the gas industry, Mr. Elson will perhaps be best remembered for his work in connection with the organisation of the B.C.G.A. annual conferences and latterly for the Gas Council's Sales and Service Conferences. Indeed, he was actively engaged on the organisation of the forthcoming Southport Conference shortly before his death. He came into contact with many members of the industry in his work of distributing publicity material to gas undertakings and area boards. His work also covered the purchase of paper and print. He was secretary of the B.C.G.A. Salesmen's Circles and played a leading part in their activities. In his spare time, Mr. Elson wrote and published a number of fairy stories for children. He was also for many years a keen and prominent member of a local choir. Mr. Elson leaves a widow and two daughters. He has a younger brother in the gas industry —Mr. S. C. Elson—who is special representative at the Midland office of the North Thames Gas Board.

Correspondence

'GRANCOLE' SMOKELESS FREE BURNING FUEL

DEAR SIR,—As one who was actively concerned, I was very much interested in Dr. King's article in your issue of March 17 recalling the work carried out at Granton, Edinburgh, in 1937 by the late Mr. Jamieson and himself on the production of a reactive coke in continuous vertical retorts.

The regular supply of coal of suitable grades with low ash content, moderate caking power, and of a type which can produce smokeless fuel which burns without violent sparking, is the most important factor in this problem. When, as at present, coal demand exceeds supply, concentration on quantity production rather than quality production seems inevitable, and in Scotland, at least, little choice is available and a substantial proportion of Group 900 coals must be accepted as part of the allocation. The former practice of segregating particular seams for gas-making purposes appears to have been abandoned, and, with the policy of central washing plants serving several pits, may not be easily re-established.

'Grancole' has been produced regularly in Edinburgh, as Dr. King indicates, but the production is not much greater than on the experimental basis and possibly represents only about 1½% of the total coke produced at the works. It has been difficult throughout the war years and after to maintain quality consistently, and no attempt has been made to market it at its economic price. It has, therefore, not been possible to arrive at any estimate of potential demand; and it may be that, if the economic price were charged, the market might be limited to those keenly interested in smoke abatement. The designation of smokeless zones, with the compulsory use of smokeless fuels therein, might, however, readily alter marketing possibilities.

On the other hand, if coals of the type and quality suggested were available at reasonable prices, the cokes produced therefrom at normal carbonising temperatures in continuous vertical retorts might be preferred by householders, as the lower cost would more than compensate for the purchase of modern coke appliances.

The present emphasis on the necessity for a curtailment in the tonnage of suitable coal used for gas-making and the consequent gasification of increasing quantities of coke and oil must continue until coal supply or allocation difficulties are overcome. When that stage is reached it may be possible to determine the correct policy to pursue.

The principle of the 'Rochdale' process, described so fully in the same issue of the 'JOURNAL,' might also be applied to assist in solving the problem. The reduction in the ash content of the fuel should make a considerable difference, especially where, as in Scotland, the ash is of a flocculent nature; but even more interest probably lies in the suggested alteration in the structure of the coke.

Yours faithfully,

DUNCAN D. MELVIN.

Scottish Gas Board,
26, Drumsheugh Gardens
Edinburgh, 3.
March 20, 1954.

Gas in FRANCE

abstracts from the French technical press by 'ASHTON'

The Editor of the *Journal des Usines à Gaz* discusses in his January number the prospects of the gas industry in 1954. 'The economic situation is indeed full of uncertainty. But how can one lack confidence when one sees, in spite of growing competition, a generally poor outlook, and the extreme mildness of December, the regular development of gas sales thoughout 1953?' His optimism is justified by the recent publication by the Energy Commission of the second plan of modernisation and equipment, since this contemplates that the total sales of gas will reach, in 1961, 4,000 mill. cu. m. (say, 140,000 mill. cu.ft.; the latest figure to date is just under 3,000 mill. cu. m.), an annual growth of 4.2% and 90,000 consumers. Expenditure is estimated on this basis, but whereas the first plan emphasised production and transmission, this time the accent is on distribution.

The general policy of Gaz de France does not vary; it remains directed to research and to the purchase of the cheapest possible 'raw calorie'; it leads in certain cases to the most intense utilisation of petroleum products. Before the war there was only 'gazole' (the new French equivalent of 'gas oil') and to a certain extent propane; gas oil for the carburetting of water gas in the larger works; and propane used, as such, in distribution pipes of small diameter, in half a dozen small towns.

The Changing Technique

By 1945 the position is considerably different. Petroleum has become an important raw material for the production of gas. Statistics show that this development has become a characteristic feature of the gas industry. Consumption of petroleum products in 1945 was only 26,000 metric tons. In 1953 it was 86,000 tonnes (63% more than in 1952). And it is no longer a question of gas oil and propane only; other products have replaced them and added to them.

For the enrichment of water gas, paraffin distillates, and more recently heavy oils, tend to take the place of gas oil, which itself is considered too valuable for this purpose. Cracked in the presence of a catalyst, as at Cahors, heavy oils are transformed into oil gas directly utilisable. Heavy oils have also found an interesting application in the heating of small furnaces by way of a special producer.

As to propane, which figured at only 61 tonnes in the statistics of 1946, this has gained a place in gas technique, standing at 8,000 tonnes in 1953. Distribution of pure propane has multiplied, but several towns are now supplied with mixtures of air and propane, and there are at least two districts with an installation for the production of gas by the 'autothermic' cracking of propane. Nor is the use of propane confined to small undertakings. It is extensively used in peak load plant by such very large works as the coke plant at Gennevilliers, Villeneuve-la-Garenne, and Loos.

Finally, the permanent gases of the refineries must soon come to play an important part in gas supply.

A significant pointer to the importance of these developments is the agreement signed on November 19, 1953, by the companies controlling the distribution of liquid gases and Gaz de France in regard to the sale of propane and butane.

In February the Editor notes the incidence of real winter. 'As if set off by the same trigger, gas heating appliances were lighted up all at once, emission of gas shot up like an arrow, attaining figures never before reached.' Undertakings have had to bring into action every device in their possession for dealing with peak loads, utilising on a big scale such petroleum products as heavy oils, paraffin distillates, propane, and even butane. The problem would have been easier, he remarks, if Gaz de France had at its disposal, particularly near to the capital, such vast reserves as would be provided by underground storage.

Underground Storage?

It has been noted in the national Press that Gaz de France is already prospecting on a site 16 miles west of Paris, where geological boring suggests that there may exist a 'gas-tight dome,' a sort of underground bell enclosing beds of rocks impregnated with water which would serve to stock something like 150 or 200 mill. cu. m. of gas. 'One can see the immense scope represented by such a reserve and its effect on distribution, notably in satisfying the peak demand for heating which practically has no limit, and also on the operation of gas-making plant which could run with complete regularity without those always undesirable *saw teeth* (our italics).' He refers to American and German practice and prospects in this direction. When one considers that the biggest French gasholders are of 225,000 cu. m. capacity (U.S.A. has already gone to 500,000) and when one contemplates underground storage of 100 to 200 mill. cu. m., that marks a turning-point in the evolution of gas supply technique.

In a study of gas in the forms of energy available in France, M. J. Mothes, Engineer to the Commercial Department of Gaz de France, notes that since 1938 to 1952 France has succeeded in increasing her industrial production by 40% while diminishing her imports of solid fuel by 15%. She has at the same time doubled her production of hydraulic electricity and tripled the capacity of her petroleum refinery. M. Mothes saw an important transformation in the structure of the national consumption of energy. A considerable increase had taken place in the employment of prepared fuels, electricity and gas, while that of raw coal had remained stationary. Coal, after having been the principal form of energy, tends more and more to become the raw material of the industries of gas and electricity—a transformation which he compares with that in the field of food where cereals are consumed not in their original form but in the forms of meat and milk. Coal will be for electricity generating stations, coke ovens, and gasworks, what crude petroleum is to the refineries. In the period under review and in the domestic field alone the consumption of electricity has increased by 120%, that of gas 50%, of gas oil 220%, and of prepared solid fuel 270%. This study is illustrated by ten tables of statistics.

Gas in the Economy of France

A table of indices of industrial productivity relative to 100 for the year 1938 shows that in October, 1953, gas stood at 176, in November 198, compared with electricity 204 and 217 for the two months respectively, coal (solid mineral fuels) 123 in both months. The general index exclusive of building was 139 for the first 11 months of 1953.

The wave of cold weather which set in the last days of January caused a sharp rise in the sales of all forms of fuel, except that of water-generated electricity which

was in short supply. At the end of December stocks of coal for 18 days' supply were in the hands of Eléctricité de France, 33 days in those of Gaz de France; on the other hand, Gaz de France had 515,000 tonnes of coke in stock. During January the demand for gas exceeded, momentarily, the capacity of a large number of gasworks.

Another item of general interest is a further modification in the composition of the Council of Administration of Gaz de France by a decree of December 17, 1953. The number of members is increased from 12 to 15, made up of five Government representatives (two appointed by the Ministry of Industry and Commerce, two by the Ministry of Finance and Economic Affairs, one by the Ministry of Public Works), five members of competence in industrial and financial affairs, of whom at least two shall be representatives of local authorities with their own undertakings of electricity and gas, and five representatives of labour organisations. Monsieur Le Guellec is confirmed in the office of President of the Council.

Protective Coverings for Mains

M. Ribaud, Director of Research of Gaz de France, contributes a study on the detection of faults in the insulation of protective coverings of underground gas mains. The method is electrical, and principally the Pearson method, in which two observers are placed parallel and above the centre line of the main in electrical contact with the soil and separated at a distance of several yards. Differences of potential in the soil along and around the main are observed. He finds that these differences are more marked in the direction transverse to the main than parallel to it. If the covering is of good quality and intact, the differences are very slight, some millivolts. For a covering of medium quality it may attain some tens of millivolts, for a poor quality a much higher value, and, finally, for an open leak differences of potential of the same order as for bare metal—that is to say, of the order of one volt.

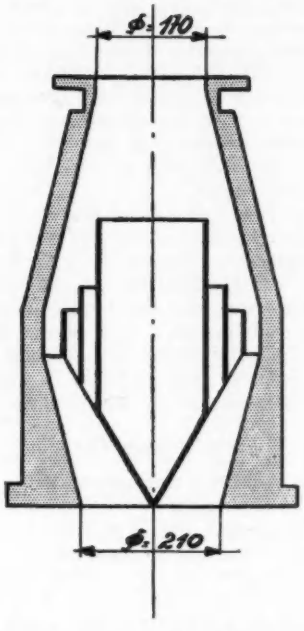
The study shows that faults are not detected by differences of potential taken in contact with the main; but that observations taken at the surface of the soil, particularly if graphed not parallel but transversely to the main, as the author now proposes, will reveal leakages and other defects and will do so on a graduated scale so that the degree of defect may be inferred.

An application is described of infra-red radiation from gas heated elements to the drying of synthetic paints and lacquers.

A New Compressor (Booster)

A new booster on the Roots principle but with helicoidal rotors is described by M. P. Riet, Engineer to the gas undertaking of Nantes (*Journal des Usines à Gaz*, February, p. 44). The difference is that the rotors are not cut parallel with the axis but helicoidal. Figs. 1 and 2 here reproduced show the construction 'in the form of two helical gears in forged steel.' A curious feature is that the 'male' element has four 'teeth' (or threads) and the female six. The driving gears keyed to the shafts are arranged to give the male element 10,000 r.p.m. to the female's 6,666 r.p.m. The rotors are machine-cut out of the solid. The shafts are bored up the centre and oil is continuously pumped through them both for cooling purposes and (by way of suitably placed orifices) for lubrication. They revolve in a water-cooled casing. Contrary to the classic Roots compressor, the gas traverses the machine in a direction parallel to the axes of the rotors.

The noise produced by the gearing is *assez strident*, and the speed of rotation of the rotors (a peripheral speed of



102 m. per sec. for the more rapid of them) would produce a noisy passage of the gas if the inlet and outlet of the compressor were not fitted with silencers. These take the form of a steel plate cylinder of diameter double that of the inlet and outlet pipe, lined with perforated plate containing insulation of about 2 cm. of cork dust. In the centre is a cone and three concentric cylinders forming deflectors. The construction is shown above.

The advantages claimed for this design are practically those which are claimed for the classic Roots type. Three

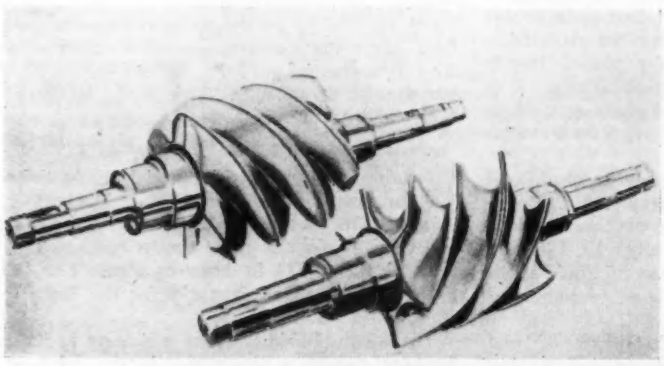


Fig. 1

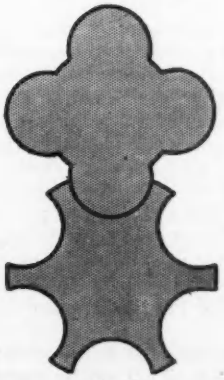


Fig. 2

*

W-D INSTALLATIONS IN AUSTRALASIA

*

	Installation		tons per day
ADELAIDE (Aust.)	1st	–	80
	2nd	–	100
	3rd	–	160
	4th	–	75
BRIGHTON (Aust.)	1st	–	60
	2nd	–	20
	3rd	–	28
	4th	–	58
	5th	–	58
	6th	–	58
	7th	–	58
CHRISTCHURCH (N.Z.)		–	150
FREMANTLE (Aust.)	1st	–	20
	2nd	–	20
	3rd	–	10
	4th	–	30
	5th	–	30
GEELONG (Aust.)	1st	–	60
	2nd	–	20
	3rd	–	20
	4th	–	20
	5th	–	40
	6th	–	40
IPSWICH (Aust.)	1st	–	20
	2nd	–	13
LAUNCESTON (Aust.)	1st	–	20
	2nd	–	10
	3rd	–	10
MELBOURNE (Aust.)	1st	–	160
	2nd	–	160
	3rd	–	160
	4th	–	160
	5th	–	160
	6th	–	160
	7th	–	160
	8th	–	160
	9th	–	160
	10th	–	160
PERTH (Aust.)	1st	–	80
	2nd	–	40
	3rd	–	165
PORT PIRIE (Aust.)		–	22
SYDNEY (Aust.)	1st	–	210
	2nd	–	210
	3rd	–	210
	4th	–	210
WANGANUI (N.Z.)	1st	–	20
	2nd	–	40
WOLLONGONG (Aust.)	1st	–	36
	2nd	–	12

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compressors with capacities of 3,000 cu. m. per hour have been installed at Roche-Maurice to feed the main to Nantes with one of 1,500 cu. m. per hour and one of 3,000 cu. m. per hour to drive gas towards the Forges de Basse-Indre.

Continuous Enamelling Tunnel Oven

M. M. Heintz, General Manager at Strasbourg, discusses the use of gas in continuous tunnel enamelling furnaces at the Etablissements Pain at Lipsheim. The heating equipment is radiant tubes, town-gas fired, obviating the necessity for muffles. The objects to be treated are first 'pickled' and then suspended by hooks on a continuous chain supported by rollers on a continuous H iron runway. They first pass through a chamber in which the enamel is applied by 'pistols,' then through a drying chamber equipped with finned pipes in which circulate the hot products of combustion from the combustion of gas in the radiant tubes of the 'cooking' chamber. From the drying chamber the pieces pass to a pre-heating tunnel, followed by the high-temperature 'cooking' chamber. Here the path is in the form of a U, the bend of which is the zone of maximum temperature, while the two branches form a zone of heat exchange between pieces entering and pieces leaving the tunnel. The pieces entering reach a temperature of 600°C. before the final 'cooking' of the enamel, while pieces leaving gradually lose heat to a temperature of 50° to 60°C. before removal from the chain. The details of control, evacuation of moisture and fumes, etc., are of considerable interest. The total length of chain is 151 m., the length of the 'cooking' zone, where temperature reaches 700° to 900°C., is 7.5 m., the time cycle is 13 min.

Blue Flame Burners

Memoirs of the Sté. des Ingénieurs Civils de France, fascicules 5 and 6 of 1953, carry two contributions bearing on gas practice.

A contribution to the study of low pressure tuyères (*trompes, cones divergents*) applied to blue flame gas burners, by M. H. Cobigo, was the Giffard Prize Essay of 1950, awarded in 1953. The memoir 'was not specially prepared in view of the Giffard Prize, but the author, chief of the research laboratory of one of the most important French constructional companies making gas appliances, has tried, for his own advantage and that of his work, to understand precisely the mechanism of the entrainment of primary air in atmospheric burners of the domestic type.' He does not claim complete success but thinks his work will save considerable time for future workers, particularly as literature on this subject is practically non-existent.

The method is experimental and analytical. Apparatus is illustrated and described. The effects of initial and back pressures and the shape of the cone of the tuyère are examined. The author's conclusions are that the efficiency of such burners—defined as the ratio between the work necessary to entrain the requisite primary air and the work exerted by the jet—decreases as the pressure in the terminal chamber (the furnace?) increases, and *vice versa*. The volume of air entrained is a direct function of the diameter of the orifice and an inverse function of the pressure in the terminal chamber. The object is to design a burner in which the fraction, air entrained by nozzle over air necessary for complete 'neuter' combustion, is in the neighbourhood of unity. Such a burner is achieved in a design where the total area of emission is some 14 times that given by the classic formula of Kowalke and Ceaglske, which is quoted as

$$\Sigma S = 0.85/K_1 \times (1+R)\frac{(d+R)\,S}{d}$$

Where ΣS is the area of emission from the terminal chamber
R, the ratio air/gas
d, the density of the gas
S, the sectional area of the injector
K_1, coefficient of emission of ΣS.

In a lengthy lecture on the reactivity of coke, MM. Egalon, Hoebeke, and Jarcsek describe laboratory tests and continuous measurements in practice designed to evaluate different cokes from the point of view of make of water gas per ton and per unit of plant. The apparatus is described and illustrated in detail. Among the conclusions are: (1) The cycle must be adapted to the reactivity to get the best out of the better cokes; (2) the coke itself acts as a catalyser more or less effective in terms of its measured reactivity; (3) it is industrially advantageous to treat separately cokes of different reactivity; (4) with a coke naturally super-reactive or specially activated, as for instance by the addition of 1% Fe_2O_3 to the fines, the exothermic reaction CO to CO_2 in the presence of steam persists throughout the producer up to the low temperatures at the top of the fuel bed; and (5) with the same coke activated by the addition of 1% Fe_2O_3 coke consumption per unit of gas production is reduced by 12%. The work was carried out with the assistance of the Etablissements Kuhlmann.

LILLE INTERNATIONAL FAIR

The Lille International Trade Fair, to be held this year from May 1 to May 16, is a technical and economic manifestation open to industries all over the world. It is situated in the heart of the Northern Region of France, one of the most important agricultural and industrial areas in the Northern Countries. Very suitably and conveniently situated for meetings, conferences, and exchanges of views between members of the principal European nations, it is one hour by road from Brussels, and less than 160 miles from London.

The Fair occupies a superficial area of about 240,000 sq. yd., of which 96,000 sq. yd. include covered halls of gigantic dimensions. The grand Palace, which is known practically the world over, itself covers a superficial area of about 1 hectare on one single piece of ground. The frontage measures 120 metres long by 30 metres high, the whole entirely covered with aluminium, and is considered as one of the finest realisations of modern architecture.

About 3,500 exhibitors are received every year and include firms of about 15 different nationalities. One and a half million visitors are admitted annually, of whom 300,000 are English, Belgians, Dutch, Luxemburgers and Germans. Fifteen different countries allow special facilities and reductions in railway fares, air and sea transport upon presentation of the 'Fair Identity Card,' issued by the Fair authorities, French Consulates, and the principal travel agencies.

ROADS EXPENDITURE

The Government has decided to increase expenditure on major road improvements and new road construction. It is proposed that annual payments from the Road Fund for this purpose shall be increased from the present level of £5 mill. a year to between £14 mill. and £15 a year in 1957-58, and that they shall continue at that level for a period of years. Writing in *Road Tar*, the publication of the British Road Tar Association, the new President, Mr. W. K. Hutchison, C.B.E., Chairman of the South Eastern Gas Board, comments that, although in some quarters disappointment has been expressed, we should be grateful that at least there *is* a plan and that it shows an increase in the expenditure to be allowed. The increase, although it sounds substantial, is in fact not nearly sufficient to cover the amount required to make up maintenance arrears, to eliminate black spots, and to make a start on the kind of highways which our growing industries must have. Only a fraction of the £10 mill. can be available towards implementation of the Special Roads Act which, at the time it was passed in 1940, was estimated to cost £150 mill. 'Nevertheless a start has been made, and this Association and its members are more than willing to co-operate by placing their services and the results of road tar research at the disposal of the Ministry of Transport and all surveyors throughout the country. We believe that tar can play a full and proper part in road development, as it has done in the past.'

Stapleton Road Works, Bristol

STEAM AND POWER GENERATION

FROM A PAPER TO THE SOUTH WESTERN SECTION OF THE INSTITUTION OF GAS ENGINEERS ON MARCH 17, 1954, BY

J. PARKER,

Assoc.M.Inst.Gas E.

Assistant Production Engineer, Bristol Sub-Division, South Western Gas Board.

The paper deals with the planning and development of the steam and power services of the new gasworks extensions at Stapleton Road, Bristol. Basically these services have been designed to provide maximum economy in the use of steam and power.

Steam will be raised at a pressure of 250 lb. per sq. in. and at a temperature of 600°F. in the waste-heat boilers of the new carbonising plant and in a water-tube boiler equipped with a chain-grate stoker designed to burn coke breeze at 0-½ in. size. With the exception of the boiler feed pumps and turbo-exhausters, the whole of the high pressure superheated steam will be applied to the generation of electricity. For this purpose an 1,800 kW pass-out turbo-alternator has been installed. The turbine will also provide pass-out steam against a back pressure of 20 lb. per sq. in. for heating and process work on both new and old works.

Importance has been attached to the question of feed water treatment, to minimise scale formation and corrosion, not only in the boilers but also in the feed lines, feed heaters, superheaters, and in the blading of the turbo-alternator. A combined process of lime softening, followed by sodium-ion and hydrogen-ion exchange in a carbonaceous zeolite filter, has been chosen. An independent de-aerating plant has been installed to reduce the gas content of the feed passing into the boilers.

Pressure-reducing and de-superheating equipment has been installed to provide saturated steam at 20 lb. per sq. in. in substitution for the bled steam from the pass-out turbo-alternator when the latter is out of action for maintenance and overhaul. Another steam pressure reducing system transfers steam to the existing works at 100 lb. per sq. in.

Electric Drives Throughout

Electric motors have been adopted throughout the works as the normal drive for all plant, apart from the coal gas exhausters and boiler feed pumps. Standby drives are also electric, with the exception of emergency diesel-driven units for the liquid purification process and two steam-driven producer air-blast fans. There are some 244 electrically-driven plant units, as distinct from automatic controls and instruments.

Electricity will be generated and distributed on the works at 3,300 volts. The alternator will run in parallel with the public electricity supply system, thereby allowing any surplus power to be sold, in the interests of national fuel economy, to the Area Electricity Board. The works are linked by duplicate 11,000-volt feeder cables to one of the principal distributing centres of the British Electricity Authority's network in Bristol, and it is possible to obtain a power supply from separate power stations at Feeder Road, Bristol, and at Portishead, thus giving exceptional security.

The internal electrical layout has been designed to achieve reliability. Power is supplied to the various sections of the works at 3,300 volts by means of a system of ring main feeders. Seven small sub-stations, situated at convenient load centres, transform power taken from the ring mains from 3,300 to 415 volts to supply the machinery and plant, and each sub-station has two isolating switches so that any section of ring main can be disconnected for repair in the event of a fault, or for maintenance, without loss of supply.

The preliminary scheme for the construction of the new works at Stapleton Road was initiated by the Bristol Gas Company in 1946, and under the directions of Mr. James Carr, O.B.E., plans and specifications were prepared for the installation of a carbonising plant of 10 mill. cu.ft. per day capacity, together with appropriate facilities for the handling and storage of coal and coke. Major contracts for these plants were placed in 1947. A contract was also placed for the erection of a 6 mill. cu.ft., all-welded, four lift, spirally-guided gasholder in a ferro-concrete tank.

Much preliminary consideration was given to the lay-out of the complete works, and it was decided to cater for the future development of a second complete system of carbonising and ancillary plants having a capacity of 10 mill. cu.ft. per day, similar to the first installation. Site area was also set aside for future C.W.G. plants. After nationalisation, the South Western Gas Board proceeded with the development of the project, and further contracts were subsequently approved by the Board.

Brief Description of Works

The new carbonising plant built adjacent and parallel to the existing horizontal retort houses comprises four independent benches of West's 50-in. retorts in balanced heating settings. There are 32 retorts per bench and the benches are arranged in line. With normal scurfing, the guaranteed output of this plant is 10 mill. cu.ft. per day using 75% Midland and Durham coals and 25% of coals from Bristol and Somerset collieries.

The retort house is bisected by a central dormer enclosing twin lipped bucket elevators and other coal and coke conveying machinery. Waste heat boilers, arranged in two batteries of three boilers, are separately housed in annexes adjoining the main building. At ground floor level in one annex, a water-tube boiler of 15,000 lb. per hour capacity has been installed, and provision has been made in the other annex for the future introduction of a similar unit.

The settings are heated by hot producer gas supplied from West's mechanical producers, arranged in two batteries of five producers. A band conveyor running through a basement beneath the producers takes the ashes to a skip hoist and hopper at one end of the retort house.

Rail wagons are handled by two 'Rotaside' tipplers each housed in separate concrete buildings designed to enclose the wagons as they are overturned and so prevent the dispersal of fine coal dust. From receiving bays beneath the tipplers the coal is conveyed to the retort house on twin 36-in. band conveyors, and finally by lipped bucket elevators to 60-hour capacity storage bunkers over the benches. Coke from the retort house can be taken either to the grading plant or to the coke stocking yard by a band conveyor system.

A 36-in. bore overhead mild steel welded foul gas main, approximately 300 yards long, interconnects the retort house and the ancillary gas cooling and washing plant situated in the north western corner of the site.

The primary coolers comprise two vertical tube condensers in parallel, employing water which is circulated and re-cooled in a cooling tower. There are duplicate

centrifugal exhausters each capable of handling 500,000 cu.ft. of gas per hour against a pressure of 72 in. W.G. with 8 in. W.G. vacuum on the suction side. Both machines are driven by direct-coupled 150 H.P. back-pressure steam turbines running at 8,450 r.p.m. Secondary gas cooling plant at the outlet of the exhausters comprises two vertical tube condensers in series, employing clean river water. Two electro-detarrers are arranged in parallel followed by three 4-bay 'Multifilm' washers in series.

The 'Manchester' liquid purification process has been adopted for the complete removal of hydrogen sulphide. This plant, with attendant pumps and air blowers, is arranged in two parallel streams, each capable of purifying 6 mill. cu.ft. of gas per day.

Schemes for benzole recovery and gas dehydration have been planned, but the installation of these plants has been deferred.

Process Steam and Power Requirements

One of the first steps in planning the process steam and power system of the works was to assess the steam and electrical requirements with reasonable accuracy.

(a) *Process Steam.*—With the exception of the boiler feed pumps, only two steam-driven prime movers on the works will be normally in use—namely, the turbo-exhauster and the turbo-alternator. Sufficient exhaust steam will be derived from these machines at a pressure of 20 lb. per sq. in. for all heating and process work including the steaming of retorts and by-product recovery. Owing to the nature of the processes very little condensate is recoverable.

It is proposed that a proportion of the pass-out steam from the new turbo-alternator will be employed on the old works, mainly for steaming the existing vertical retorts. In consequence, the process steam demand will be improved, thereby increasing the level of economic power generation. The maximum process steam demand, however, will be in excess of the steam produced from waste heat, and for this reason a solid-fuel fired boiler has been installed. Waste-heat steam production has been estimated on an assumed fuel consumption figure of 12% of the coal carbonised, but there is now reason to believe that the fuel consumption figure may be as slow as 10%. Thus less waste-heat steam will be available and more steam may have to be raised from solid fuel.

Steam will produce about 1,080 kW of electric power. This level of power generation is, in effect, realised mainly by the flow of process steam, which remains generally constant throughout the day and night. It is always necessary to have a small flow of steam in the condensing stages of the turbine to prevent overheating due to the effects of windage losses.

The quantity of steam used to drive the turbo-exhauster corresponds closely with the requirements of the gas liquor concentration plant which is sited in the same locality of the works.

(b) *Lower Pressure Steam Mains.*—Thermodynamically, one of the requirements for maximum efficiency is that the power units should exhaust at as low a temperature (and, therefore, pressure) as possible. Careful consideration must thus be given to the determination of the process pressure and to the correct sizing of the pipes required to convey the process steam to the various parts of the works.

It is probable that all the by-product recovery plants at Stapleton Road could have been designed, without undue difficulty, to utilise saturated exhaust steam at a pressure as low as 5 lb. per sq. in., but distribution of steam at this pressure over the extensive site occupied by the works would have required the installation of large bore pipes involving undue capital costs. It was decided, therefore, that a pressure of 15 lb. per sq. in. should be made available for process work; and to maintain this pressure at the extremity of the system it was necessary to arrange for the turbo-alternator to discharge pass-out steam against a back pressure of 20 lb. per sq. in.

The sizes of steam mains have been determined according to the method given by L. G. Northcroft, based on the formula developed by Weirz and Brabbee. A pressure drop in the order of 2 lb. per sq. in. per 1,000 ft. of straight pipe has been allowed. The pass-out main from the turbo-alternator is 12 in. bore dividing into 8 in. bore and 9 in. bore pipes which serve the retort house and the by-product circuits respectively.

The low pressure pipelines from sizes 2½ in. bore and upwards have been fabricated from weldless steel tube to B.S.S. 806 Grade 'C' quality, with welded on flanges. For sizes 2 in. bore and below, welded tubes to B.S.S. 1387 Class 'C' quality have been used, having flanges screwed on and expanded.

The lagging applied to the pipes consists of 2 in. thick 'Amosite' asbestos preformed sections secured in position by means of 1 in. mesh galvanised wire netting and supercoated with a ½ in. thick layer of armouring cement reinforced with hessian. Outdoor lagging has been weatherproofed with ⅛ in. thickness of emulsified bitumen and finally painted with two coats of bitumous aluminium paint.'

(c) *Power Requirements.*—The many power-operated plant units installed can be classified under two broad groups—namely:—

(i) Materials handling plant, comprising coal, coke, and ash handling plants.
(ii) Fluids handling plant, comprising pumps, fans, boosters, compressors, etc.

The power requirements of these plants have been calculated from the usual formulae.

Power Loadings

From the schedules of electrically driven plant, the power loadings of the various sections of the works have been summarised and tabulated. Table 1 takes into account every machine to be installed, including standby units. Table 2 takes into account the plants in use, excluding idle standby units.

TABLE 1.—*Aggregate Power Loadings of All Machines.*

Section of Works	No. of machines	Rated B.H.P.	Absorbed kW
Coal handling plant	14	274	154
Retort house	141	970	590
Washing plant	40	241	142
Water circulation	12	398	248
Liquid purification	33	763	551
Total	240	2,646	1,685
Boosters and compressors	4	1,100	830

TABLE 2.—*Aggregate Power Loadings excluding Idle Standbys.*

Section of Works	No. of machines	Rated B.H.P.	Absorbed kW
Coal handling plant	14	264	154
Retort house	106	761	462
Washing plant	25	167	94
Water circulation	9	283	177
Liquid purification	22	525	382
Total	176	2,010	1,268
Boosters and compressors	2	550	415

(*d*) *Electric Motors.*—Electric motors have been adopted throughout the works for all plant; and even where duplication is regarded as essential, both first and standby drives are electric. The only exceptions are emergency oil-engine driven standbys for the liquid purification process and two steam-driven producer air blast fans.

The different types of motors installed are as follows:—

TABLE 3.—*Different Types of Electric Motor.*

Type	Number
Squirrel cage	145
Squirrel cage (vertically mounted)	19
Slip ring	12
Variable speed	4
Pole changing (two speeds)	2
Small miscellaneous motors	62
Total	244

It will be seen that the majority of motors are of the squirrel cage type, which by reason of their simple construction, possess a dual economic advantage of low price and low maintenance cost. The adoption of high tension supply on the works allows the use of 'direct-on' line starting, which shows considerable saving in capital and

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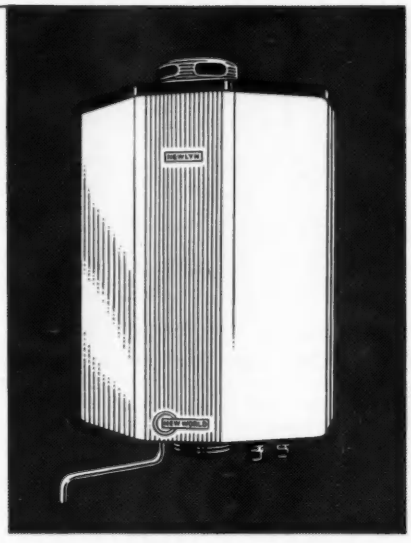

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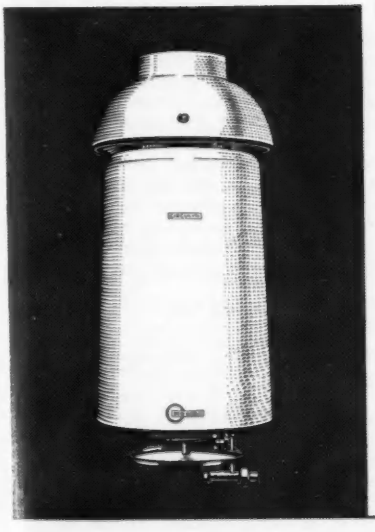

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maintenance costs compared with star-delta or the gear required for slip-ring motors.

To reduce the number of spare motors to be kept in stock and to facilitate interchangeability and maintenance, it was decided to adopt, as far as possible, totally enclosed, squirrel cage, four-pole motors, of sizes 1, 3, 5, 7½, 12½, 20 and 30, and 40 H.P. These selected horsepower ratings have matched remarkably well with the plant requirements. Notwithstanding the large number of drives involved, very little extra capital cost has been sunk in oversize motors.

The figures given in Table 2 show that the aggregate rated horsepower of the electric motors in use is 2,010 B.H.P.—which is equivalent to 1,500 kW; while the aggregate full-load power required by the plants to be driven is 1,268 kW. Taking an average for the whole works, motors will be running at 84.5% full load, or, by inverting this statement, motors will be 18% oversized. As it is normal practice to allow at least 10% to 15% margin on motor power to cater for any abnormal load condition which might arise during the starting and running of the plant, the over-motoring due to standardisation is negligible.

It is of interest that 4.6 units of electricity are used per ton of coal carbonised on the old works, while the corresponding figure for the new works is estimated to be 28.8 units.

Water Supplies

(*a*) *River Water.*—An ample supply of cheap water is one of the first essentials to the efficient operation of a gas-manufacturing station, and in this respect Stapleton Road works is fortunate in its proximity to the River Frome.

A new building has been constructed on the North bank of the river to house three centrifugal pumps which take their suction from a deep concrete intake chamber beneath the floor of the pump room. Each pump has a capacity of 30,000 gal. per hour against a total working head of 209 ft. and is driven by a 55 H.P. motor. The water is delivered to the works along 400 yards of 10 in. bore, internally coated, cast iron pipeline with bolted gland joints, to a storage tank of 127,000 gal. capacity situated on top of the coke grading plant at a height of 130 ft. above yard level. Float-operated switches mounted on the tank automatically start and stop the working pumps. One of the three pumps acts as a standby. For security, duplicate power cables have been taken to the pump house.

To prevent ingress of floating débris into the pump suctions, a trash rack of steel bars has been built at the entrance to the intake channel, followed by a series of removable mesh screens. On the delivery side, a battery of three cylindrical sand filters has been installed to remove fine mud and silt which are carried in suspension in the river water, especially during storm conditions. A chlorinator has been provided to sterilise the water and thus prevent the fouling of the filter beds and the growth of algae in the supply pipes and on the heat exchange surfaces of cooling plants employed in various parts of the works.

It is estimated that the overall cost of delivering clean sterile river water to the point of usage on the works, including the capital charges on pumping equipment, storage tank, and pipelines will be about 2½d. per 1,000 gal.

(*b*) *Softened Water.*—Water obtained from the River Frome varies in its composition according to seasonal changes and rainfall conditions. Its average hardness properties are as follows:—

	Parts per 100,000
Total hardness	41
Total temporary hardness	30
Temporary hardness due to magnesia	7
Uncombined carbon dioxide	3
Permanent hardness	11

The high percentage of temporary hardness in the raw water dictated the choice of a lime softening process. The conventional hot lime-soda process, however, suffers from the defect that, in normal circumstances, a residual hardness of 2-3 parts per 100,000 cannot be eliminated and the 'softened' water gives rise to considerable trouble in pipelines and boilers due to the deposition of sludge, and the formation of scale, by what is known as 'after-precipitation.'

By means of the combined lime-zeolite process whereby the lime treated water is passed through a bed of carbonaceous zeolite, the constituents causing 'after-precipitation' are eliminated and the hardness of the final water is reduced to zero.

The main lime softening vessel is of orthodox cylindrical design, 15 ft. 6 in. diameter by 25 ft. 6 in. high, having a conical bottom and central mixing tube. Its dimensions allow a full three-hour retention time for a maximum treatment rate of 6,000 gal. per hour. The use of a rapid reaction softener was precluded by the fact that the magnesia content of the water is too high to permit a satisfactory reaction being obtained. The water is preheated in the primary gas coolers to a temperature of 120° F. prior to softening.

From the lime reaction tank the partially softened water is pumped through a filter vessel containing anthracite and then through a similar vessel accommodating a bed of carbonaceous zeolite. The booster pumps handling the lime-treated water are of special design with end-suction, open impellers which do not easily become choked with scale deposits.

As the water passes through the bed of carbonaceous zeolite, a combination of actions takes place. Firstly, the zeolite acts as a catalytic filter and brings about the completion of the lime/bicarbonate reaction, retains the precipitated calcium carbonate, and absorbs any excess lime. Secondly, the bed of zeolite acts as a base-exchange softener in which the calcium and magnesium ions of the salts contributing to the permanent hardness are replaced by sodium ions, and regeneration of the zeolite is effected by means of brine in the usual way. Thirdly the carbonaceous zeolite can exchange hydrogen ions for calcium and magnesium ions, converting some of the hardness salts into corresponding acids. For this latter action to take place the zeolite must be regenerated with very weak sulphuric acid. The acid used also removes calcium carbonate and excess lime, which are filtered out in the upper layers of the zeolite bed.

Costs of Softening

The advantage of this form of lime/zeolite softening is that at the completion of the treatment the water is free from calcium and magnesium salts and cannot, therefore, give rise to scale formation in the boilers. Also, by adjusting the proportions of the brine and acid used to regenerate the carbonaceous zeolite, sodium bicarbonate produced in the sodium-exchange reactions can be neutralised by the acids produced by hydrogen exchange, and in this way control of the final alkalinity is possible.

The relative costs of removing hardening salts from water equivalent to one part of calcium carbonate are given in Table 4.

TABLE 4.—*Relative Costs of Softening Reagents.*

Reagent	Delivered price per ton—January, 1954	Cost of removing one part $CaCO_3$ per 100,000
	£ s. d.	d./1,000 gal.
*Lime	6 16 8	0.056
*Soda ash	12 3 0	0.141
Salt	7 16 0	0.163
Sulphuric acid	19 11 9	0.310

* In practice an additional 10% lime and up to 50% soda ash may be necessary in order that softening reactions shall be as complete as possible. In certain circumstances, it may be cheaper to use salt, instead of soda ash, to effect the removal of permanent hardness.

The cost of chemicals required for water having the hardness properties given in this paper amounts to 5.64d. per 1,000 gal., which compares very favourably with conventional lime/soda/sodium aluminate softening followed by phosphate treatment to mitigate 'after-precipitation' troubles.

It is estimated that the overall cost of treatment, including capital charges, attendance, maintenance, and

power, together with a full debit for the value of the original untreated water, will be about 16d. per 1,000 gal.

(c) *Cooling Tower.*—Water for the power generating plant and the primary gas condensers will be recirculated over a cooling tower. By this means the temperature of the cooling water will be reduced to 80° F. Atmospheric conditions in the south west during the summer months can be hot and very humid, and the water obtained from cooling towers is often not so cold as we should like. A separate supply of colder water is usually necessary to achieve final cooling of the gas, and the secondary gas coolers will, therefore, be supplied with river water.

During 1949, wet-bulb temperatures above 60° F. were sustained for an average of 10½ hours per day on no less than 85 days. Wet-bulb temperatures above 65° F. were sustained for an average of five hours per day on 27 days.

The cooling tower was specified to reduce the temperature of 262,000 gal. of water per hour from 100° F. to 80° F. with atmospheric conditions corresponding to a wet-bulb temperature of 65° F. On a few hot afternoons, wet-bulb temperatures of 68° F. may be experienced, and under these conditions the re-cooled water temperature will be 82° F. The maximum quantities of water returning to the tower will be:—

198,000 gal. per hour at 98° F. from the power plant.
64,000 gal. per hour at 120° F. from the primary gas coolers.

Several alternative forms of cooling tower were considered, and the choice finally rested between two kinds:—

(i) A concrete hyperbolic tower with timber interior.
(ii) An induced-draught tower constructed entirely of timber.

The induced-draught tower was selected because it involved the smallest capital outlay and required the least amount of soft timber, which was, at the time, difficult to obtain. Although fan running costs must be taken into account, these costs are off-set by reduced water pumping charges due to the lower height at which the water is returned and distributed over the induced draught tower. The ground area required by the induced draught tower is one-third less than the area needed for a natural draught concrete tower, and the space so gained has improved the site as regards future extensions.

The cooling tower installed consists of two rectangular cells, side by side, each 42 ft. long by 30 ft. wide by 22 ft. high. On top of each cell is a 5ft. high bell-mouthed stack, installed around a 20 ft. diameter, four-bladed, axial-flow, fan. Each fan is driven through a horizontal extension shaft and right-angle reduction gear by means of a 20 H.P., two-speed, weatherproof motor, situated outside the wet air stream.

The use of two-speed motors allows full advantage to be taken of the lower wet-bulb temperatures occurring throughout the winter months. During this time the water will be cooled sufficiently with the fans running at half speed, and, as a result, the horsepower required by the fans will be reduced to one-eighth of the full-speed load needed for the peak temperatures occurring during the summer.

Steam Generation

In recent years, national fuel shortages have emphasised the need for greater economy in the use of heat and power in all industries. This has stimulated a trend in gasworks towards the adoption of more efficient steam and power generating plants designed to make more effective use of waste heat leaving carbonising plants. To obtain more efficient heat cycles, steam pressures and temperatures have been increased.

(a) *Waste-Heat Boilers.*—Six waste-heat boilers arranged in two batteries of three boilers are accommodated in separate boiler-rooms in the new retort house. In each battery of three boilers, one will act as a standby for the other two.

The boilers are conventional Spencer-Bonecourt fire-tube type with riveted shells 8 ft. diameter by 15 ft. 6 in. between tube plates. The capacity of each boiler is 8,000 lb. per hour. The induced-draught fans in all cases are electrically driven by direct-coupled motors running at 970 r.p.m. Fans and motors are installed at floor level. The motors have special heat-resistant insulation.

A special feature of the boilers is that Tracy steam purifiers, manufactured by Foster Wheeler, Ltd., have been fitted inside the drums in lieu of the usual anti-priming pipes, to ensure that carry-over of solids in the steam is reduced to a minimum. Usually waste-heat boiler superheaters are of vertical 'hairpin' tube pattern, and as the tubes are not self-draining, it sometimes happens that soluble salts are deposited in the bottom return bends. Superheater tube failures have been experienced on the existing waste-heat boilers due to excessive salt deposits causing overheating of the metal of the tube. The steam purifiers should also reduce the possibility of salt deposition and corrosion in the blading of the turbines.

Steam Conditions

After consultation with the boiler makers and turbine designers, it was decided that steam conditions of 250 lb. per sq. in. and 600° F. were economically the best choice. Some of the factors affecting this choice were:—

(i) The steam conditions of 250 lb. per sq. in. and 600° F. could be reached without fundamental change in the design of the waste-heat recovery plant. For working pressures above 250 lb. per sq. in., the boiler makers preferred to reduce the diameter of the boiler shell and to obtain full heat by adding an economiser.
(ii) The arrangement of economisers and additional flue gas trunking required 50% more space than the standard waste-heat boiler layout.
(iii) Maintenance costs would be higher than for a plant of orthodox design, due to the cost of cleaning economisers and keeping tight joints. Additional fan power would be required.
(iv) A superior category of valves and fittings is required if working pressures exceed the standard demarkation figure of 250 lb. per sq. in., and valve costs are increased by about 18%.

The total steam raised from the waste heat leaving four benches is calculated to be 26,700 lb. per hour, based on a producer fuel consumption equivalent to 12% of the coal carbonised and assuming that the waste gases entering the boilers contain not more than 50% excess air.

(b) *Solid-Fuel Boiler.*—A Babcock and Wilcox water-tube boiler having a normal evaporative capacity of 15,000 lb. per hour has been installed at ground floor level in a boiler room annex adjoining the retort house. The working pressure is 250 lb. per sq. in. and the final steam temperature is 600°F. The waste-heat boilers are housed on the floor above.

The forced-draught chain-grate stoker fitted to the boiler is particularly suited to the burning of gasworks breeze, and the makers have guaranteed the boiler output, and its efficiency, when firing breeze of 0-⅜ in. size and having the following screening analysis:—

	%
Over ¼ in.	14
¼ in.-⅛ in.	30
⅛ in.-1/16 in.	26
Less than 1/16 in.	30

At normal output, an efficiency of 73% is guaranteed.

To assist the ignition of the low-quality fuel a fan is incorporated for recirculating hot gases from the combustion area through the fuel bed at the front of the grate. The grate is 7 ft. wide × 16 ft. long, presenting an effective area of 112 sq. ft. Ashes and riddlings from the grate are collected in firebrick-lined hoppers accommodated in the basement beneath the boiler. Water sluicing pipes and a water immersed drag-bar conveyor deal with the hot ashes which are finally discharged on the producer-ash band conveyor in the retort house sub-way.

A convective type superheater is fitted, and the boiler is also fitted with a Green gilled-tube economiser. Between the economiser outlet and the induced-draught fan a Davidson 'Cellular' grit collector is fitted.

Owing to the high percentage of dust in the coke breeze, serious consideration was given to the problem of avoiding dust emission from the boiler chimney. To

ascertain what grit burden the boiler gases might contain, an investigation was conducted on a hand-fired Lancashire boiler installation burning fine breeze. During these tests the boilers were being fired at high combustion rates with maximum air blast, and under these conditions a grit concentration in the flue gases of 0.9 grain per cu.ft. was measured. By way of illustration, this would correspond to the emission of over 1 ton of dust per day from the new boiler if grit collectors were not fitted. Samples of dust were extracted from the waste gases in the main flue so as to represent, as closely as possible, the grading of the dust escaping from the chimney stack. A size analysis of the dust indicated that 89% of the particles was above 60 microns in size, and of the remainder, 50% was below 40 microns. On this basis, which simulated the worst possible conditions, the makers stated that the overall efficiency of the grit collector fitted to the new boiler would be 96%, reducing the grit concentration in the waste gases passing to the stack to 0.036 grain per cu.ft. In the normal practice, unless soot blowing is taking place, the grit concentrations should be very much less than those presented by the tests. Better results would be obtained by the use of flue gas washing plant or electrostatic precipitators, but the cost of these types of plant could not be justified on a small boiler installation.

Instrument Panel

The boiler is provided with a totally-enclosed cubicle-type instrument panel supplied by Electroflo Meters Co., Ltd. The instruments include a four-point vertical, edgewise draught indicator, a multi-point temperature recorder, superheated steam and saturated steam pressure gauges, and a CO_2 indicator and recorder. In addition an Electroflo steam flow/air flow indicator and recorder is included.

(c) *Feed-water System and De-aerating Plant.*—The layout of the retort house has allowed the steam raising plant with its ancillaries and pipelines to be conveniently divided into two sections. In each half of the retort house there is a separate feed-water system comprising a softened water storage tank of 10,000 gal. capacity at roof level, from which the feed-water gravitates to a hot well tank arranged to provide a positive suction head for the boiler feed pumps situated at ground level. The total quantity of feed-water used will be very accurately measured by a Lea electrically integrating V-notch meter at the inlet to the hot well tank.

All feed pumps are of Weir direct-acting, steam driven type and can draw water from duplicate suction bus-mains. The water delivery to the waste-heat boilers passes through a tubular feed-water heater designed to raise the water temperature to 200°F. There are two feed connections to each boiler, one goes through the automatic feed regulating valve, the other through a hand regulating valve. The feed to individual boilers is metered by George Kent, Ltd., shunt type, integrating meters. A Hick Hargreaves recirculating de-aerator having a maximum capacity of 60,000 lb. per hour has been installed.

(d) *High Pressure Steam Mains.*—The high pressure steam range in the retort house consists of duplicate 8 in. bore steam collecting mains which run the entire length of the retort house and receive steam from all boilers. The two mains are linked together by looped interconnections which are fitted with two isolating valves. While one collecting main is isolated, the steam load can be transferred on the other. As regards lagging, the use of 'Amosite' asbestos has been specified because this material is suitable at temperatures up to 1,000°F., whereas ordinary magnesia lagging decomposes at temperatures above 650°F. and must be protected by the application of a priming coat of special high-temperature composition next to the hot surface.

(e) *Pressure Reducing and De-superheating Equipment.*—Steam will be available on the completed works at three pressures—namely:—

(1) At 250 lb. per sq. in. and 600°F. from the new boiler plants.
(2) At 20 lb. per sq. in. saturated, or slightly superheated, from turbines exhausting into the process steam system.
(3) At 100 lb. per sq. in. and up to 425°F. from existing waste heat and Lancashire boilers.

Provision has been made to supply steam through reducing valves from the high pressure boilers to the process steam lines, and to the main steam system on the old works.

To provide suitable process steam when the turbo-alternator is out of action for maintenance and overhaul, a pressure reducing and de-superheating system, having an output capacity of 35,000 lb. per hour, has been installed. The equipment comprises a 3 in. bore pressure reducing valve controlled by a Hopkinson-Carlstedt electric regulator. The de-superheater consists of a 15 ft. length of 12 in. bore tube fitted with four spray nozzles for injecting water into the steam at the outlet of the reducing valve.

This method of de-superheating has the advantage of simplicity, but it presents a difficulty in that chemically pure water free from dissolved salts is required. As far as possible condensate will be collected for use as de-superheating water. If the condensate quantity is inadequate, softened water will be used instead. As the softened water will have a low dissolved solids content, and in view of the fact that the de-superheater may only be in use for a short period of a few weeks every two years, when the turbo-alternator is being overhauled, the amount of deposit formed should give no serious trouble. The de-superheating section can be easily removed from the steam line for cleaning, should this prove necessary.

Power Generation and Distribution

When electricity is generated from steam in a straight condensing turbine, as is the practice in most power stations, about two-thirds of the heat is virtually thrown away in the condenser. On a gasworks, supplies of both heating steam and power are required, and by the adoption of a back-pressure turbine exhausting its steam into a process system a great increase in thermal efficiency is attained.

(a) *Turbo-Alternator.*—The new power house at Stapleton Road is designed to accommodate two large turbo-alternators, but only one machine is at present installed; the second set will be introduced when the works is extended. The turbo-alternator installed has a continuous maximum rating of 1,800 kW. The turbine was manufactured by W. H. Allen, Sons & Co., Ltd., and is of multi-stage impulse type with one pass-out stage and a surface cendenser. The turbine operates at a speed of 6,250 r.p.m. and is geared to the alternator which runs at 1,500 r.p.m. Alternator and exciter are of Lancashire Dynamo and Crypto, Ltd., manufacture.

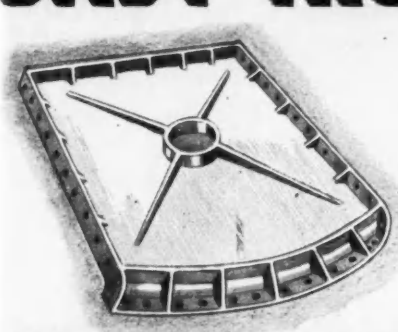
One difficulty associated with process steam and power plants is that of balancing the process and power loads. This is achieved most conveniently by means of a pass-out turbo-alternator working in parallel with the public supply of the Electricity Authority.

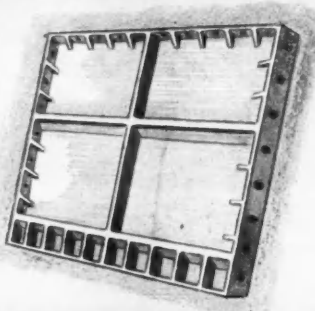
In the pass-out turbine steam is exhausted after the initial stages of expansion against a back pressure of 20 lb. per sq. in. It is this steam which operates with high efficiency, because the heat which it contains after expansion is used for heating and process work. Steam additional to that required by process is expanded through the second stage of the turbine to a high vacuum, after which it is condensed. In this way the heat of the exhaust steam and the condensate is lost.

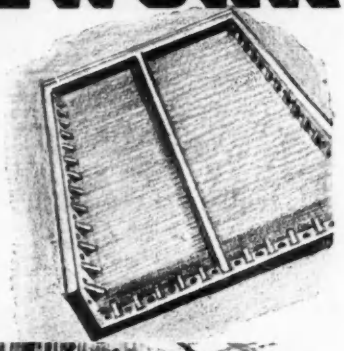
The generation of electricity is kept in step with the steam available by means of inlet steam pressure governing. This method of governing has the advantage that the turbine cannot reduce the boiler pressure by drawing too much steam. By keeping a constant high boiler pressure the turbo-alternator will generate the maximum number of kilowatts possible from the steam available. The steam pressure in the pass-out branch is also governed, so that when steam is available in excess of the process demand, the extra steam will be automatically passed into the condensing stage of the turbine.

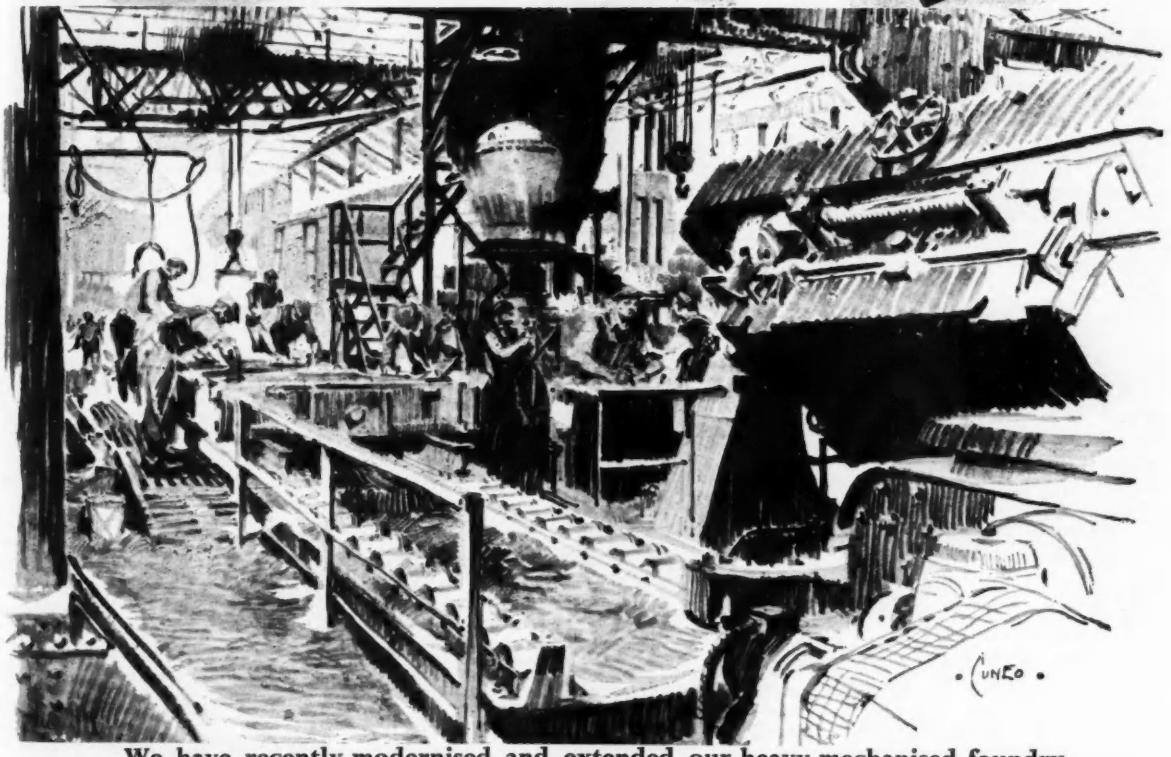
To ensure continuous operation the steam condenser is divided in half on the water side so that one-half can be isolated for cleaning purposes while the other half is at work. Aluminium/brass tubes are fitted in the condenser as a safeguard against corrosion and the possibility of

CAST IRON PLATEWORK









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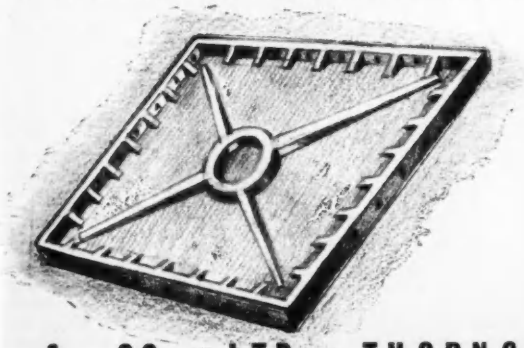

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tube failure. In the water circulating connections entering and leaving the condenser flexible rubber expansion pieces have been fitted.

Duplicate condensate extraction pumps and oil coolers are provided.

(b) *Electrical Supplies to Works.*—In view of the extensive adoption of electrically-driven plant, it has been essential to ensure that a continuous power supply will be available at all times and under any conditions. To afford the necessary reliability, two 11.0 kV feeder cables have been laid into the works by the South Western Electricity Board. These alternative supply cables, each having a capacity of 1,500 kVA, are fed from separate bus-bar sections at a major B.E.A. sub-station, which in turn is supplied by quadruplicate cables from Portishead power station, and by duplicate cables from Feeder Road power station, Bristol.

In separate brickwork cubicles at ground floor level in the work power house, two 11.0/3.3 kV transformers have been provided in order to reduce the pressure of the incoming supply and to step-up the voltage of the surplus generated power sold back to the grid.

(c) *Internal Electrical Layout.*—Electricity will be distributed throughout the works at 3.3 kV by a system of ring mains feeding seven small sub-stations. The sub-stations are strategically located adjacent to the principal load groups previously mentioned, and will act as distributing centres whereby power taken from the ring mains will be transformed and supplied at 415 volts to all machinery and plant. Each sub-station consists of one or more 3,300/415 volt transformers, together with all the necessary 415 volt switchgear, which is of oil-immersed type.

A standard capacity of 300 kVA has been adopted for the sub-station transformers, which have identical dimensions and cable entry positions, so that a spare unit could be quickly substituted in the event of an emergency. Certain transformers on the existing works have special low voltage tappings to give 365 volts.

The power house has been sited near the geometric centre of the works; the centre of electrical loading is at a point approximately mid-way between the new power house and the retort house building. The lengths of steam mains and electric cables have, therefore, been kept as short as possible.

The current generated, and the power received from or sold to the B.E.A., are controlled by the main switchboard in the power house. There is a section switch in the main 3.3 kV bus-bars. On each wing of the board are three outgoing feeder switches, one alternator switch and a switch for one of the incoming B.E.A. supplies. The intention is to operate each ring main with an open switch at one of the sub-stations in the circuit, thus leaving each portion of the ring main fed from separate halves of the main switchboard.

Whenever possible, electric cables have been run overhead supported on walls of buildings, plant structures, and service gantries. All power cabling used on the works is paper insulated, lead covered, and steel wire armoured.

DISCUSSION

Mr. **C. R. Ingham** (Chairman of the South Western Section of the Institution of Gas Engineers) said Mr. Parker was selected by him in 1950 to take a prominent part in the planning and design of the large extensions which they were carrying out at Stapleton Road, and he could assure the members that the author had played a man's part. The proof of the pudding was in the eating, and they would not know for some years how well he had done his work; but he had the greatest confidence in saying that Mr. Parker had done a splendid job, and the paper would for a long time prove of great help.

Mr. **D. W. G. Scott** (Bristol) said the paper represented a lot of work carried out in the past four years. In many ways it would serve as a text-book and a guide to anyone who was installing electric motors and other equipment. The keynote running through the paper was heat economy and the most efficient use of power. On an old works there was much that could be done to improve heat services, but the Stapleton Road works was unique in that it enabled a start to be made from scratch, and everything to be designed to help heat economy and fuel utilisation. The works was an example of a new trend in steam and power generation. The old idea was to distribute low-pressure steam to various parts of the works and use it on prime movers. Although that was a steady and reliable way of carrying on, there were inevitable losses even when the prime movers were not working. The new idea was to generate the steam and use it in one very efficient prime mover, the turbo-alternator, which, in turn, generated the electricity to serve the units on the rest of the works. This was what had been done at Stapleton Road.

It was worth while drawing attention to the various safeguards that had been set up. They had rather a lot of eggs in one basket; and to guard against the possibility of failure, both the steam mains and the electricity supply had been duplicated. In the case of electricity, both the supply from the B.E.A. and the self-generated supply had been duplicated. The cables supplying the works were in the form of a ring main. The in-coming supply from the B.E.A. was duplicated from two separate generating stations, so that, if one station failed, there was a chance that the other would keep going.

Cost of Grit Removal

Mr. **O. H. W. Boonham** (Cheltenham) asked if there was any physical reason why steam passing out of the low-pressure system should not be taken through the turbo-alternator in intermediate stages. He also raised the question of grit concentration, and commented that the author had not said much about costs. It would be interesting to know what would be the cost of reducing the grit concentrations in the waste gases.

Mr. **Parker,** in answer to Mr. Boonham's first question, said that there would normally be a very small quantity of steam passing, and the introduction of an additional complication to the turbine would have meant much capital expenditure. Concerning grit concentration, they had no information as to cost. They had put in the very best kind of grit-arresting plant. To have gone beyond that would have involved flue gas washing or electrostatic precipitation of the dust, and the cost of that kind of plant would have been in the region of £6,000 to £7,000, which was almost as much as the cost of the boiler. The efficiency of the system installed was very high, and it would completely remove hard particles of grit. What it would not remove was dust of size grading of 50 microns, some of the particles of which were not much larger than those contained in smoke. However, they were confident that the heavier dust would be removed effectively.

In rgard to the cost of power generation, he could give some figures, but they might prove controversial. First of all, to arrive at the cost of generation of electricity it was necessary by some means or other to arrive at the cost of steam—both process steam and waste heat steam. The total cost of power generation was assessed at a figure of 0.77 per unit; and that, broken down, comprised 0.05d. for labour, 0.452d. for steam (and that alone was more than the B.E.A. was prepared to pay for exported power), 0.054d. for maintenance, and 0.21d. for capital charges.

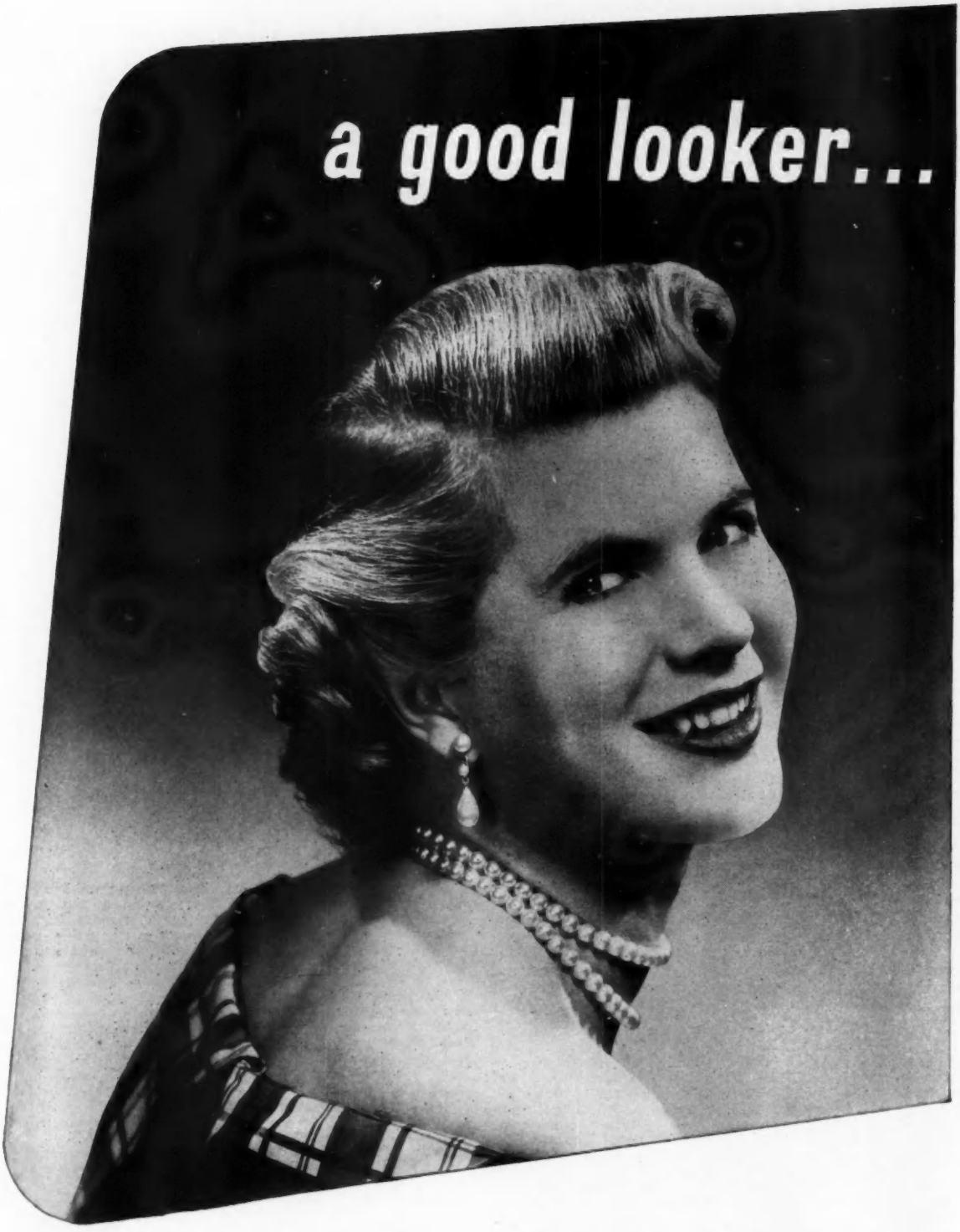
The Costs of Duplicating Plant

Mr. **P. J. Whitehead** (Swindon) referred to the author's statement that in each battery of three waste-heat boilers one would act as standby for the other two. In older works he realised that it was necessary to duplicate many things, but he wondered what had prompted the decision to have standby waste-heat boilers throughout, seeing that power generation was to be in parallel with the grid. Mr. Whitehead also asked whether it would not have been advantageous to have two alternators instead of one.

Mr. **Parker,** answering Mr. Whitehead, pointed out that, if there was not a standby boiler, there would be an immediate loss of 6,500 lb. of waste-heat steam when a boiler was put out for annual inspection. That quantity of steam was capable of producing 500 kW if the turbo-alternator was working at full capacity, or 250 kW if it was working at half capacity. If they had to purchase that quantity of power it would involve an increase of about £6 per kVA.

As to the size of the alternator, the plant installed had a maximum rating of 1,800 kW. This was based on a particular set of conditions. It might be that the process steam demand at some other time would be less than that indicated in the paper, which represented the maximum possible demand for steam on the works. When every process was taking steam they generated less electricity. Conditions might arise in which the volume of steam available would be capable of generating power in excess of the capacity of the turbo-alternator. That machine had been fitted with a load limiting device, so that, if for some reason the pass-out flow was restricted and the whole of the steam generated passed to the machine, it could not overload itself. The cost of installing two machines instead of one had been examined, and they had in fact con-

(*Continued at foot of p. 749.*)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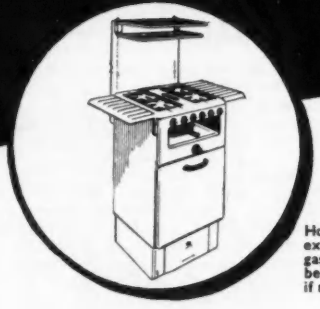

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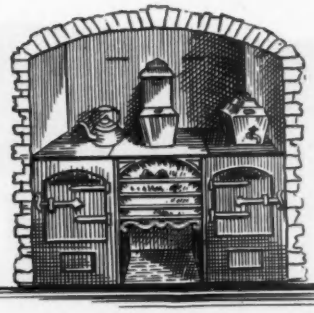
. . that the patent Kitchener was invented by William Flavel (1779-1844) and superseded the open fire and spit. A full page advertisement in 1829 stated that "*It was constructed on new and improved principles and adaptable to all fire places from three to ten feet in length.*"



. . to-day the pride of the kitchen is the Flavel '68'

This medium priced bow-front cooker has caught the attention of the observant housewife. She likes the attractive and durable finish, the larger than usual oven, and the fast efficient hot plate—Yes there's every satisfaction in selling the '68'!

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THE **HANDY - RACK**

There'll be a demand for this clever feature! Be sure you can meet it! Fixed in a matter of minutes to the '68'. Prevents burns and obviates excessive bending. Housewives will welcome it!

FLAVELS *of* **LEAMINGTON**

MAKERS OF FINE COOKING AND HEATING APPLIANCES SINCE 177

DESIGN OF A FLUELESS HEATER

FROM A PAPER TO THE LONDON AND SOUTHERN JUNIOR GAS ASSOCIATION ON MARCH 12, 1954, BY

E. R. H. RAINS,

Assoc.M.Inst.Gas E., Watson House, North Thames Gas Board.

In most fields of gas utilisation, the desired end is reasonably well defined. A water heater must supply hot water efficiently; a cooking stove must convert raw ingredients into palatable foods. To talk about a simple flueless convector heater in these terms, however, does not make the matter very clear, as any such heater convects efficiently once the gas is ignited. The aim might be described as to provide a required degree of thermal comfort by heated air to the occupants of a room, with due consideration of the standards of safety regarded as necessary.

When the new B.S.1250 is published, the designer will have these standards laid out in detail. In the meantime, the following requirements should be considered in design:—

(a) For a fixed flueless heater, the temperature of the mixed air and products shall not exceed 350°F. and should preferably be less than 250°F. These same temperature limits also apply to the surface temperature of the outlet grille.

(b) The surface temperature of the remainder of a convector heater must not exceed 200°F.

(c) In special cases, such as for use in nurseries and some public buildings, the maximum temperature of the products must not exceed 200°F. and the temperature of any part of the surface that might be touched accidentally must not exceed 150°F.

In practice, the main design problem is the achievement of a high heat input with low outlet temperatures. The requirements of combustion standards, the lighting across of the burners, and the stability of flame under draught conditions are relatively simple of solution. The question of wall discoloration is bound up with outlet temperature, and local high surface temperatures can usually be eliminated by the use of shields.

There are examples of appliances, such as oil stoves, which have given satisfactory service for years with outlet temperatures up to 1,000°F., and no-one during the war complained that the temperature of the coke stove in his Nissen hut was greater than 250°F. Rather than generally tolerate these higher temperatures, however, the implications of the suggested standards are that it is better to compromise on a mean situation and to have appliances that can be placed with the knowledge that only reasonable discomfort could be caused to persons incapable of looking after themselves. All domestic heaters are judged by this standard.

Over the past decade or so, a wide variety of forms of convector heaters and radiators have been tested and examined. Many different arrangements of louvres, inlets, outlets, burners, etc., were included. Many had elaborate forms of deflector plates and inner casings. It was not clear which items were desirable and which were not. It was decided to make an attempt to determine the more important features of design; and while it is not claimed that all the possible features or combinations have been examined, it is hoped that the results obtained will prove useful to manufacturers and simplify the design of heaters which are neat, cheap, and technically satisfactory.

The Experimental Heater

In order that the work should be done on a heater having external dimensions and layout conforming to practice, the dimensions of about a score of the larger gas convectors in use were noted and the experimental heater made to have a case of typical size and form. The external dimensions were 30 in. by 18 in. by 7 in.

The apparatus permitted the following variations:—

(1) The burner could be moved in both horizontal and vertical planes.

(2) The air inlet could be arranged to be at the front, back and bottom, or any combination of these.

(3) The outlet could be at the front or back—or both.

(4) The inlets and outlets could be plain openings or louvred openings adjustable in size, and the louvres were reversible so that they sloped either up or down.

(5) Adjustable plates were available for deflecting or smoothing-out the flow.

(6) A selection of venturis could be fitted into the body of the heater so that this principle could be investigated.

(7) A removable central plate with an aerofoil section at its lowest edge was available to investigate the possible decrease in outlet temperature by the extraction of more heat by radiation without allowing the heat exchanger to cause a loss of flow of air through the heater.

Tests

Assuming that the experimental heater has an average surface temperature of 150°F., the heat loss from the external surfaces is 2,000 B.Th.U. Altogether, about 150 variations of form of the heater were investigated, and as a means of comparison the chosen criterion was that condition found by experience to be the most difficult of all the specified design requirements to satisfy—that is, the outlet temperature. The initial object of the work was to

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(*South Western I.G.E., concluded from p. 745*)

sidered the installation of two machines of 1,000 kW capacity. The total cost of two machines would have been £50,000; the cost of the one machine was £30,000. For the two machines they would have had to duplicate various services, which would have increased the cost still further.

Mr. **D. R. Jones** (Bristol) said there had been considerable debate in the fuel industry, and there had been relevant correspondence in the *Journal of the Institute of Fuel* on the question of grit concentration. Although flue gas washing plant did not remove a given amount of grit per volume of waste gas it could concentrate the grit over a residential area, and in fact result in less benefit to the public in the immediate vicinity. It would appear that the type of grit removal favoured at Stapleton Road might give better results than those from flue gas washing plants.

Mr. **Parker** said he had no available figures relating to flue washing plants, but he agreed that such conditions as those indicated by Mr. Jones might arise. If they passed flue gas—in other words smoke—through a washing plant, the particles of less size than one micron were removed; such particles were very much smaller than the particles in the tobacco smoke such as was present in the meeting room at that moment. There was not much merit in installing such elaborate plant on a boiler of the kind in question. After all, it was a very small boiler compared with those found at power stations.

Mr. **J. P. Taylor** (Canon Marsh, Bristol) asked why, at a time when almost every conceivable piece of plant on a gasworks was to be electrified, the exhausters had been left out of the list.

Mr. **Parker** replied that they had selected steam drives for the exhausters because they felt they were the most vital machines on the works, and they must ensure complete reliability. Moreover, steam had the advantage of greater flexibility than had electrical drive.

Mr. **T. W. Clapham** (Bristol) said one reason why the turbo-exhauster was chosen was its proximity to the liquor concentration plant. They had found that they could recover from the exhauster sufficient steam to concentrate their ammoniacal liquor. There were many respects in which the paper would be useful in the years to come—not the least in regard to water treatment, scale formation, and standardisation of such minor items as nipples and grease guns.

A vote of thanks was accorded to the author on the proposition of Mr. **J. W. Denton** (Torquay), seconded by Mr. **R. B. Glover** (West's Gas Improvement Co., Ltd.).

keep this as low as possible, and, later on, to be concerned about the other requirements.

The heater was originally designed with its burner spread over the central 5 in. A big improvement in lateral distribution was obtained by increasing the effective length to 14 in. A series of tests was then made to determine the pattern of the flow in a heater having a front outlet and various positions of air inlet. It was found that the hot gases were swept to the back or front by the air entering the heater, but remained central when the air inlets were at back and front. The combined effect of different inlet and outlet arrangements showed that a smooth passage, unchecked by change of direction, allows for a larger throughput of air and lower outlet temperatures.

The alteration of burner height showed the greatest effect on the outlet temperature following the initial equalling-out of the temperature across the width of the appliance. The effect of raising the burner with the open base was less marked, but a lower average outlet temperature was obtained from the closed base heater. This lower temperature is probably caused by the rather more intimate mixing of this heater. A very complicated pattern of air flow could be observed when a smoking taper was introduced with the incoming air, especially when the burner was in a low position.

The use of a curved plate smoothing-out the air entry showed no improvement, but made some difference at the outlet. In this particular heater, the top is near the louvre and acts as a lead, and it is thought that generally a lead to the outlet is a most desirable feature.

The effects of altering the air inlet when the outlet was relatively large, and, again, when it was relatively small, were observed. Then, with a fixed air inlet, the outlet was varied. Although it may not be easy to decide the effective areas of the openings, it is clear that a restriction of either will cause higher temperatures, and that of the outlet is of greater importance.

The results also indicate that with the single bar burner not all the 7-in. depth is being utilised to good effect, the cross-sectional area of the heater being 126 sq. in., whereas the temperature rise curve was becoming flat when the outlet area exceeded 60 sq. in.

A double row of burners would probably decrease the outlet temperatures further, or a shallower heater give similar results more cheaply.

Several manufacturers have introduced venturis into the construction of their heaters, and these tests include differing distances of the burner from the venturi, variable inlet air conditions, and alterations to venturis. On this particular heater the effect of adding a waist to the straight-sided heater was negligible until it caused a restriction and increased the outlet temperatures.

Since the 3⅛-in. venturi gives the same temperatures as the straight 7-in. wide heater, this confirms the point made in the last section that the full depth of the heater is not being utilised.

The attempt to interpose a plate which would not impede the air flow and, at the same time, extract and radiate some of the heat, proved unsuccessful to the extent of 20°F., or more, rise in outlet temperature. A simple heat distribution grid in the form of a corrugated strip of aluminium, 3 in. wide, extending across the heater in an attempt to spread the heat over the whole section, made little difference to the outlet temperature.

An 'Ideal' Heater

It was then decided to use the data obtained to try out the performance of an 'Ideal' heater, keeping the following requirements in mind:—

(a) The burner arrangement should be such that the flames light across and the heater is free from maintenance difficulties.

(b) Existing regulations state that if a burner on an open based stove is nearer than 4 in. from the floor, floor protection is necessary.

(c) The flames should preferably not be visible through the louvres.

(d) The general regulations of B.S.1250.

Table 1 gives a few details of present-day convector heaters, and a comparison is made with the 'Ideal.'

COMPARISON OF 'IDEAL' AND EXISTING CONVECTORS

Heater	Gas rate cu. ft. per hr.	Height in.	Approx. overall volume cu. in.	Maximum outlet temp. °F.
A	13.5	20	1,300	1,000
B	10	20	1,600	455
C	16	30	6,000	450
D	12	30	4,200	435
E	9	30	2,700	362
F	20	29	3,500	355
G	15	26	3,300	328
H	15	26	2,800	314
I	20	30	3,800	284
J	30	34	7,600	270
K	6	37	2,400	268
L	20	31	5,000	250
M	15	36	3,300	250
N	10	30	3,500	234
O	10	30	3,500	206
P	16	30	3,600	200
Q	15	28	2,800	188
R	8	24	1,700	185
S	10	30	3,800	175
'Ideal'	10	30	3,800	134
'Ideal'	20	30	3,800	169
'Ideal'	30	30	3,800	204

Summary

The following suggested rules for the construction of a convector heater refer chiefly to an appliance of similar dimensions to the experimental heater—tall enough for the heater body to exert some flue effect. (It has been found that dropping the burner 2 in. is no cure for high outlet temperatures of a heater having an effective burner height of 6 in.)

(a) Take full advantage of all the available height and keep the burner as low as possible.

(b) Arrange the inlet and outlet so that the path of the heated air through the appliance is not impeded.

(c) Fix a simple guide plate at the outlet to eliminate dead corners and turbulence near the louvre position.

(d) Distribute the heat as evenly as possible across the whole width of the heater.

(e) There is nothing to be gained by complicating the construction by the addition of venturis and an elaboration of guide plates, inner ducts, and casings.

SULPHUR RECOVERY CONFERENCE

The Institute of Fuel has arranged for a conference, to be held in London on October 6 and 7, 1954, to study the removal and recovery of sulphur from fuels. All sessions of the conference will take place at the Institution of Mechanical Engineers, Storey's Gate, S.W.1. There will be two sessions on each day, in the morning from 10 to 12, and in the afternoon from 2 to 4. Among the papers to be presented are 'Social and Industrial Consequences of the Presence of Sulphur in Fuels,' and 'Sulphur in Coal Gas, and its Removal by Wet Methods,' by Dr. A. Parker *et al;* 'Methods for the Wet Purification of Coke Oven Gas, Water Gas, and Synthesis Gas,' by Dr. H. Schäfer; 'Sulphur Removal from Gases by means of Selective Ammonia Scrubbing, and Treatment of the H_2S for Production of Sulphur or Ammonium Sulphate,' by Dr. H. Bahr; 'Removal of Hydrogen Sulphide from Producer Gas and other Industrial Gases,' by R. W. Rutherford; and 'Sulphur Removal from Fuel Gas by Dry Methods,' by Dr. R. H. Griffith *et al.*

CODE FOR STORAGE OF LOW FLASH-POINT LIQUIDS

Statutory regulations are in force covering the transport and storage of petroleum-spirit under the Petroleum (Consolidation) Act, 1928. A number of chemicals which are not derived from natural petroleum are covered by the definition of 'petroleum' in the Act, and those with flash-points below 73°F., such as benzene and naphtha from coal tar, must be treated as petroleum-spirit. The Association of British Chemical Manufacturers suggested to the Explosives Department of the Home Office and to the Factory Department of the Ministry of Labour and National Service that it should draw up a voluntary 'Code of Precautions for the Storage and Use of Highly Inflammable Liquids' which are not subject to the Petroleum Act. This offer was welcomed by the Departments concerned. The Code has been based to a large extent on the Regulations under the 1928 Act for petroleum-spirit, but some of the recommendations go beyond the requirements of the official Regulations. Copies of the Code can be obtained (price 2s. post free) from the Association at Cecil Chambers, 86, Strand, W.C.2.

Institution of Gas Engineers

South Western Section Meets at Exeter

A meeting of the South Western Section of the Institution of Gas Engineers was held at Exeter on March 17 under the Chairmanship of Mr. Charles R. Ingham, Bristol Sub-Divisional Manager, mainly for the presentation of a paper on 'Steam and Power Generation at Stapleton Road Works, Bristol,' by Mr. J. Parker, Assistant Production Engineer of the Bristol Sub-Division. During the morning the members visited the gasworks at the City Basin, Exeter, where they saw the early stages of the erection of the new Woodall-Duckham continuous vertical retort installation.

The CHAIRMAN, at the opening of the meeting, extended a cordial welcome to Mr. C. H. Chester, C.B.E., Chairman of the South Western Gas Board; Mr. W. J. Baker and Mr. L. P. Ingram, Divisional General Managers of the Northern and Southern Divisions respectively; Mr. R. B. Glover (West's Gas Improvement Co., Ltd.); and Mr. E. A. Astbury, formerly of the Liverpool Gas Company and now living in retirement in the South West.

The following new members were welcomed: E. L. Eggins (Bristol); T. A. Davenport (Midlands Manager, West's Gas Improvement Co., Ltd.); H. Walton (Bristol); E. Annakin (Bath); C. N. Smith (Bath); and F. L. Whirehurst (Bath). Also elected to membership was I. F. Carr, B.SC. (Falmouth), who was especially welcomed because of long family association with the industry through his grandfather, father, and uncle.

The resignation was announced of Mr. G. B. L. Wilson (Trowbridge) on his retirement from the industry. Sorrow was expressed at the death, since the last meeting, of Mr. H. J. T. Aldridge (Aldridge & Ranken, Ltd., Bath).

Certificates gained in the Institution of Gas Engineers' examinations were handed to the successful South Western students by the Chairman.

Mr. CHESTER told the members that he was delighted to be present—as he would be on every possible occasion—because he had had quite a hand in the formation of the District Sections during his year of office as President of the Institution. It was pleasing to see how the South Western Section was growing with the influx of new and qualified members of the Institution. The rule that admission to the Section should be governed by qualification through the Institution, in collaboration with the makers of gas plant and appliances, could not but do good, and so far as the South West was concerned it would be encouraged to the full.

The new organisation in the South Western area had not yet been completed; he had hoped to be able to tell them that all the appointments had been made. Quite a lot of the members of the Section had recently been appointed to bigger responsibilities, and quite a few more would be appointed in the next week or two. To those who had not yet been seen he took the opportunity of saying that it was just a matter of the limitation of physical possibilities that had delayed the appointments. The Board was seeing up to 20 or 30 people a day, and had no time left, until the end of April. All of them would be seen, and every case would be carefully dealt with.

'I would like to say this for the panel—and for myself—that the people we have seen have filled us with admiration for the quality of the staff of the South Western Gas Board,' continued Mr. Chester. 'We have some very fine officers in the area and we are delighted to be able to fit them into the new organisation.' He assured the Section of the Board's sincere wish to take an energetic part in its education scheme which was showing excellent results in every sphere. He knew the Gas Council was backing the Institution on the question of education. The strength of the gas industry had always stemmed from the Institution, and he hoped it would long continue to do so.

Mr. INGHAM, on behalf of the Section, expressed congratulations to Mr. James Carr on his appointment as Deputy Chairman of the South Western Board; and to Mr. W. J. Baker on the M.B.E. conferred on him in the New Year Honours.

Birmingham's Output on a Cold Day

Mr. G. le B. Diamond, Chairman of the West Midlands Gas Board, spoke at the annual festival dinner of the Birmingham and District branch of the Coal Trade Benevolent Association in Birmingham on March 12.

Mr. Diamond declared that the gas industry was by no means dead; it was as alive and as virile as ever. The Ruhr was one of the places that was showing that the day of gas was not finished. It produced 9,000 mill. cu.ft. of gas a day which could be compared with Birmingham's 1,000 mill. cu.ft. on a cold day. He spoke of the efforts made and money being spent—£1 mill. in the next five years—for the development of natural gas. They wanted, he said, a substitute for coal. They had to pay more for coal than any industry in the country. While the most friendly relations existed with the National Coal Board they disagreed with the Board's methods of evaluating coal. He quoted an invoice dated 1856 dealing with a consignment of coal to the South of England. The cost was 6s. 9d. per ton. He added that while they paid too little for their coal in the past they were now paying too much.

London Juniors' Short Paper Night

In addition to two short papers, the résumé of a third was delivered at a meeting of the London and Southern Junior Gas Association in London on March 12. This was on 'The Development of New Controls for Providing Bulk High Temperature Water at Critical Temperatures,' by Mr. E. G. Brooks, of Thomas De La Rue & Co., Ltd.

Arriving breathless just in time to address the Association, Mr. Brooks, who had just returned from his trip to Germany, spoke extempore, fluently and interestingly, illustrating his points with film strips. The paper may be written at a later date for reading to the Institution of Heating and Ventilating Engineers, of which Mr. Brooks is an Associate Member.

The two papers, 'Some Factors in the Design of a Simple Flueless Convector Heater,' by Mr. E. R. H. Rains, of Watson House, and 'The Structure of Gas Catering Costs,' by Mr. H. Targett, Catering Section of the North Thames Board, and Mr. Brooks' résumé, were followed by a general discussion.

Mr. C. H. PURKIS, in opening the discussion, asked about the lagging of café boilers. Did Mr. Targett feel that insulation was a desirable feature? 'Pressure boilers,' he said, 'in particular, must suffer from relatively high heat losses, and yet it is unusual to find them insulated at all.'

Mr. TARGETT replied, later in the discussion, that technically, of course, lagging was desirable, 'but what about the purchase price? It is already difficult enough to sell a café boiler, particularly of the type Mr. Purkis mentioned, and if we are going to lag these appliances, the price is going to go up considerably.'

Another question asked of Mr. Targett was: 'What do you think of the use of solid hot plates; do you find that the use of solid hot plates increases gas consumption?'

Mr. TARGETT replied: 'The use of solid hot plates in their proper sphere is very much to be desired, but we find our employees in the kitchen do not like them very much. Again, they are quite obviously designed for consistent use, so that their use in a canteen, for example, or the private hotel I have quoted in my paper, would result in very much higher running costs. In a larger public restaurant, quite obviously, the solid hot plate would have a big effect on gas consumption.'

Mr. RAINS, replying to a question concerning the quantity of air flowing through a heater, said it was quite easy to estimate, if the surface temperature of the heater was known. He had calculated the quantity of air going through the 'Ideal' heater, at 20 ft. an hour, and it was about 3,600 cu.ft.; that was assuming a surface temperature of 150°F., but that was equivalent to only 4 cu.ft. an hour.

Others taking part in the discussion were: Mr. L. W. Andrew, Mr. N. R. Junkison, Mr. E. W. B. Dunning, Mr. S. C. Smith, and Mr. D. R. Wills, all of the North Thames Gas Board; Mr. H. W. Avis, of the South Eastern Gas Board, and Mr. H. E. Robinson, of Radiant Heating, Ltd.

The President (Mr. W. JOHNSON) concluded the discussion, and a vote of thanks to the authors was proposed by Mr. F. L. HILL, of the North Thames Gas Board.

(An extract of Mr. Rains' paper is on pp. 749-750 of today's issue; that of Mr. Targett's is unavoidably held over.)

The Leamington-Warwick Branch of the Women's Gas Federation paid a visit to the foundry and chief production centre of Thomas De La Rue & Co., Ltd., Warwick, on February 26. The members were welcomed to the factory by Mr. M. B. Jordan, General Sales Manager, and were conducted round the works in small parties by members of the sales and technical staff.

An Open Invitation
The Parkinson Stove Company look forward to seeing their many friends in the Gas Industry at this year's Ideal Home Exhibition and feel sure that they will find many things to interest them on Stand 62 (Ground Floor, Grand Hall).
STAND 62
Olympia—March 2nd to 27th
Ideal Home Exhibition
PARKINSON

THE PARKINSON STOVE CO. LTD., STECHFORD, BIRMINGHAM, 33. *A member of the Parkinson & Cowan Grou*

EMERGENCY LIGHTING AT OLYMPIA

When the Ideal Home Exhibition opened at Olympia the electricians' strike left almost all exhibitors dependent on the house lighting, which in many cases was entirely inadequate. Examples of initiative on the part of exhibitors appeared on many stands as the exhibition progressed, ranging from Tilley lamps to town gas lighting.

One of the quickest off the mark was Sidney Flavel & Co., Ltd., who by March 2 had produced in their works in Leamington Spa a number of reflector units, inside which a 32-lb. Calor gas bottle was used, and the connection brought up for a Calor gas pendant light through the centre of the reflector. This overcame the problem of illumination, and introduced some system of safety precaution on the darkened stand. The method proved quite popular, and later other exhibitors installed these reflector units for flood-lighting purposes.

At the end of the first week, however, Flavels took a decision that they would have a properly carcased system of Calor gas lighting, and this is illustrated in our photograph, with the pendant lights appearing over each of the six bays in the colonnade, and with three extra lights to illuminate the front piece and turntable. In all, through the Calor gas installation contractor, no less than 12 lights were installed on their stand, which gave extremely good service through two 83-lb. bottles of Calor gas.

Reference has been made in our columns to the centre-piece on the stand consisting of three turntables, upon which three 68/16 cookers revolved, and to the manner in which the display was animated in the absence of electrical power. Flavel's Chief Engineer and his staff developed a connection by means of a shaft under the staging into the office, where this was connected to a sprocket and chain, and the display could be manually operated. When, on the day before the opening, it was known that there would be no electricity to serve the stands, 'Calor' fitters worked through the night. Within the first eight days, 15,000 ft. of copper tubing was laid—over two and threequarter miles.

One hundred and thirty stands were equipped with over 1,000 'Calor' gas lights—equivalent to the total of 1 mill. candle-power of light.

SOUTHERN PRICES UP BY 1d. AVERAGE

The Southern Gas Consultative Council, at a special meeting at Southampton on March 17, approved a new schedule of tariffs which Mr. A. R. McBain, the Board's Chairman, explained had become necessary owing to rising costs. He said that since the price of gas was last raised in March, 1952, costs had increased by almost 2½d. a therm. The increases apply to all groups except Bournemouth, which includes Bournemouth, Salisbury, Swanage, and Langton Matravers.

There are to be increases of 1½d. a therm in Portsmouth, Gosport, Bognor, Chichester, Petersfield, Selsey, Titchfield, Southampton, Winchester and Romney, and Andover; 1d. a therm in the Isle of Wight, Weymouth and Melcombe Regis, Dorchester and Portland, Bridport, Lyme Regis, Beaminster, Sherborne and district, Aylesbury, Tring, and Buckingham; 2½d. a therm in Reading and adjacent parishes, Oxford, Abingdon and district, Didcot, and Leighton Buzzard and district; and 2d. a therm in Banbury and Adderbury and districts.

Mr. McBain said that since he met the Council in December further burdens had been placed on the Board. On February 10 it was announced by the Minister of Transport that as from March 1, railway freight charges would again be increased by 10%. This further expense, coupled with a national arbitration award of 1½d. per hour to gas workers (retrospective to October, 1953), and a nationally negotiated general increase in the salaries of graded staff from February 1, has placed the Board in the position that additional costs now exceed the savings made. Apart from the alarming rises in costs, depreciation and interest charges continued to advance, and adequate provision must be made for obsolescence and plant replacement.

The exceptionally mild autumn and early winter months of 1953-4 had resulted in decreased gas sales, which seriously affected the financial position of the Board in view of the narrow margin available under existing gas prices. The Board had decided with reluctance that the published gas prices must be increased. While the changes proposed would bring prices in the various divisions into a closer relation, the Board considered that complete standardisation was neither practicable nor equitable, and indeed would be contrary to the findings of the Ridley Committee.

It was felt that the tariff blocks should be comparable in all divisions, and it was proposed that the first block of 40 therms should now be introduced in the Northern Division. Applications had been made from time to time for special prices for particular trades or types of consumption. The Board's policy, with the concurrence of the Council, had been to give reductions in price according to the quantity of gas consumed, irrespective of the purpose of its use. The Board still felt that this policy was the most equitable method of charging for gas, and that there was no justification for granting additional concessions to certain consumers or classes of consumers on the grounds that gas was used for a special purpose. In determining the new tariff structure and prices it had, however, borne in mind the arguments put forward from time to time regarding the price to be charged to large consumers. In this connection an attempt had been made to balance the respective claims of all categories of consumers, and the Board felt that these proposals were equitable for all classes so far as possible under circumstances of continually rising costs.

While continuing the present type of tariff, it was proposed to increase the reductions in price given after the first 40 therms consumed per quarter in all divisions. The reductions from the published price would be the same in the Eastern and Central Divisions, slightly less in the Northern Division, and slightly more in the Western Division, to take account of the varying circumstances.

The Board had also considered a number of anomalies in connection with supplements charged to prepayment consumers. It seemed inequitable to charge prepayment supplements on all gas used, and in future, prepayment supplements would be charged on the first 40 therms per quarter only. In view of the increased cost of meters and of their installation and maintenance, that element of the supplement attributable to meters would be raised from ½d. to 1d. per therm for new meters from April 1.

Since the price of gas was raised in March, 1952, costs had increased by almost 2½d. per therm. The new rates would give additional revenue equivalent to an average of 1d. per therm on all gas sales, which meant that the Board would need to absorb the balance of increased costs of 1½d. per therm. It was hoped that we had reached the end of the inflationary trend and, provided there were no further serious rises in the cost of coal or in other costs outside the Board's control, they could look forward to reasonable stability in gas prices.

New Coke Ovens at Fishburn

The National Coal Board's new £2 mill. coke oven and by-products plant at Fishburn, Co. Durham, which has taken three years to build, will be brought into full operation in May. Erected by the Woodall-Duckham Company, the plant comprises 50 ovens in two batteries, and each oven holds 16 tons of coal. There is also a coke handling and screening plant. The plant will produce 250,000 tons of coke annually in addition to other by-products such as tar, benzole 1 mill. gal., toluole and sulphate of ammonia. The benzole will be refined at plants at Crook and Brancepeth, and 7 mill. cu.ft. of gas which will be produced daily will be fed into the gas grid on Teesside. The plant, which will employ 180 men, will replace older plants at Fishburn and Thrislington which will be closed down.

Australian Cooking

Australian cookery was recently demonstrated at Australia House by Miss Nancy Gepp, formerly a Home Service Adviser in Melbourne, and now of Radiation Research staff. Miss Gepp used the latest model 'New World' cooker and, before an audience of about 150, she cooked two delicious dishes—'Kimberley Spicy Steak Shortcakes' and 'Apricot Adelaide.' The latest device on the cooker, a hot-plate griddle in the centre, was employed to advantage by Miss Gepp when she grilled the bacon rolls and tomatoes. The audience, consisting mainly of representatives of the British and Australian Press, were offered four different types of Australian savouries, and later were invited to sample the dinner. Miss Gepp gave a running commentary while she was cooking, and told how the aboriginals in Australia bake kangaroos in their skins in an oven scooped out of the earth. To complete the topical interest, Australian wines were served by courtesy of the Australian Wine Board, and Miss Shirley Abicair, of television fame, appeared complete with her zither.

Engineers' Refresher Course

Outstanding addresses by Sir Hubert Houldsworth, Q.C., D.SC., LL.D., and Sir Oliver Lyle, O.B.E., at the crowded closing session of the Comprehensive Refresher Course for senior works engineers at Leeds University on March 4, provided unmistakable evidence of the remarkable success of this Course. It was the latest of the series of refresher courses organised by Incorporated Plant Engineers through its Education Committee, this time in conjunction with leading West Riding industrialists, and had been sponsored by Sir Hubert Houldsworth, Pro-Chancellor of Leeds University.

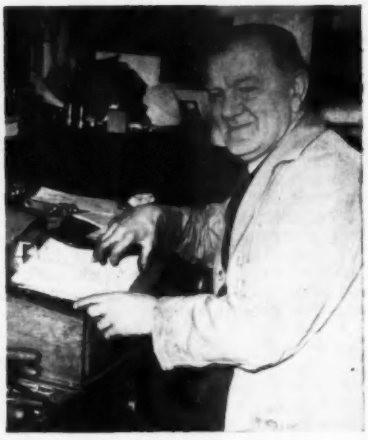
That a maximum enrolment of 342 for the 20-weeks Course was reached so very soon after the appearance of the notice announcing it was demonstration of the reputation earned by courses organised by Incorporated Plant Engineers.

For the weekly lectures throughout the winter, from October to March, the largest theatre at Leeds University has been filled to capacity, interest being sustained from beginning to end. While the bulk of enrolments had been drawn from within a radius of 30 miles of Leeds, it is significant that one member (from the Hull area) had covered no fewer than 1,600 miles in travelling to and from the weekly meetings.

109 YEARS OF SERVICE

Two brothers employed by J. & J. Braddocks, Meter Manufacturers, have achieved something of a record with a combined total of 109 years of service. Ernest Taylor (left), who is 69 years of age, has just completed 56 years as a meter maker, during which time he estimates that he has made over 25,000 meters.

Some 53 years ago Ernest helped his younger brother Granville (right), who was 13, to obtain employment at Braddocks in the clock and index department. Granville Taylor, who is now 66, has been there ever since, and has just retired from his job as a foreman brass finisher. Granville is well-known, and has spent a considerable time working on prepayment meters.



He hopes to retire in July, and intends to devote his leisure time to gardening and the keeping of poultry. His son, Harry Taylor, who followed in his father's footsteps and served his apprenticeship with J. & J. Braddocks, has over 25 years service in the meter manufacturing industry and is now manager of Cheltenham Gas Meters.

Both brothers were recently presented with cheques by the Company for their long and loyal service.

The Taylor family is unique, as there is an elder brother, Joseph Taylor, who has been in the employ of one firm as a plasterer for 53 years.

Fertiliser Production

An increase in world production and consumption of fertilisers is forecast by the Food and Agricultural Organisations of the United Nations in its latest (1953) review of the position (H.M. Stationery Office, 1s. 3d.). The only official final statistics given in the report are those for 1951-52. The returns for 1952-53, although supplied in most cases by the various Governments, are provisional only; while the figures for 1953-54 are no more than forecasts in some cases submitted officially by Governments and in others made by the compilers of the report. It is estimated that between 1951-52 and 1953-54 overall increase in world nitrogen production will be 30%, in potash (K_2O) 36%, and in phosphorus (P_2O_5) 14%, with the corresponding increases in consumption 28%, 24%, and 14% respectively.

The supply of phosphatic materials is still the most crucial factor in relation to a further general expansion in the use of fertilisers. These materials, it is considered, will figure more prominently in the expansion of fertiliser use in the newly developing countries where the emphasis so far has been mainly on nitrogenous products; and while less phosphate relatively may be used in other countries the actual amounts employed are likely to be greater. For the immediate future the prospective high world call for fertilisers should, in the view of writers of the report, be met from the resources of existing plants and those now under erection, but for the longer terms more new plants, most likely in areas, such as oilfields, where supplies of cheap energy are available, will be essential.

Diary

March 27.—SCOTTISH JUNIORS (WESTERN): Visit to Granton Gas Works, Edinburgh.

March 27.—WESTERN JUNIORS: Joint meeting with Wales and Monmouthshire Juniors. Inspection of Cheltenham works; 'Some Aspects of Accountancy,' W. E. Baggs. Cheltenham works, 2 p.m.

April 1.—MIDLAND JUNIORS: President's Day, Stourbridge, 10.30 a.m.; luncheon, Wulfrun Hall, Wolverhampton, 12.30 p.m.

April 6.—'YOUTH IN THE KITCHEN' final. Royal Festival Hall.

April 6.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster. Special meeting: 11.30 a.m. Remainder of business: 2.15 p.m.

April 7.—LONDON JUNIORS: visit to B.C.U.R.A., Leatherhead.

April 7.—YORKSHIRE JUNIORS: Visit to Metropolitan Meter Works, Nottingham.

April 8.—EASTERN SECTION, I.G.E.: Visit to Lincoln Gasworks.

April 9.—LONDON JUNIORS: Manufacturing Paper by M. S. Gaskell, Technical Director, West's Gas Improvement Co., Ltd., 178, Edgware Road, W.2. 6.30 p.m.

April 10.—SCOTTISH JUNIORS (EASTERN): Paper from an industrial representative.

April 16.—SCOTTISH JUNIORS (Western): Annual General Meeting.

IN PARLIAMENT

Air Pollution

Rightly, the damage wrought by smoke is receiving more and more attention, though even partial solution to the problem is proving a tough nut to crack. However, the cracking process was continued in the House of Commons when Mr. N. Dodds (Lab. and Co-op., Dartford) asked the Minister of Housing and Local Government about publication date of the next report of the Air Pollution Committee (the Beaver Committee). Mr. Dodds was followed by Mr. Ellis Smith (Lab., Stoke-on-Trent South), who called upon the Minister to publish a full report on research into air pollution. What practical steps are being taken, he enquired, to establish more smokeless zones and to afford additional incentives for smoke prevention.

The Parliamentary Secretary (Mr. E. Marples) replied that a further Beaver report would be forthcoming before autumn. But, he added, the Committee's interim report set out clearly the main facts at present known about air pollution and the preventive measures already in operation. He asked for the exercise of a little patience—particularly in view of the fact that the Minister has just received from the Committee further recommendations concerning the need for more extensive measurements of air pollution and greater research into the problem of pollution by sulphur compounds. He went on to say that the Minister believes that the creation of smokeless zones has a useful part to play and that he recently assured local authorities who possess the necessary powers to consider proposals for more smokeless zones.

In reply to Mr. A. S. Moody (Lab., Gateshead East), Mr. Marples said that only approved fuel appliances were installed in new houses. The problem really concerned old property.

Pat on the Back for Mr. Therm

Mr. F. R. Crouch (Con., North Dorset) asked the Minister whether he will circularise local authorities instructing them that they should not compel their tenants to cook by gas only, but should allow freedom of choice.

Mr. Marples: 'Freedom of choice is usual, but cost has to be taken into account. The Minister does not think that this is a matter on which he should seek to dictate to local authorities.

Mr. Crouch :'May I ask my hon. Friend if he is aware that a number of these new tenants have electric stoves and are unable to use them? In addition, is he aware that the larger the numbers of electric stoves used, the more easily they can be made at a rate at which they can compete in the export market? '

Mr. Marples: 'Yes, but the Minister would like freedom of choice for the consumer, and he would not like to fetter the local authority in the exercise of its discretion. In some cases pressure is being brought by the tenants for reduced rents, and freedom of choice often means slightly higher rents.'

Mrs. J. Mann (Lab., Coatbridge and Airdrie): 'Could the hon. Gentleman advise the Minister to tell the housewives to sell their electric stoves and to cook by gas, and that it is a decision they will never regret? '

In reply, Mr. Marples said he did not think the Minister would like to risk offering that advice.

Money for Research Associations

The Parliamentary Secretary to the Ministry of Works (Mr. J. R. Bevins) informed Mr. A. H. Albu (Lab., Edmonton) that the rates of grant to industrial research associations are normally reassessed every five years. There was no general reduction in these rates in 1952, though some research associations whose grants became due for reassessment received somewhat stiffer terms for the next five years. As compared with the final estimates for the current year, the estimates of the Department of Scientific and Industrial Research for 1954-55 provide for an additional £91,500 for the research associations.

'Electricity Fumes'

Questions then turned to 'sulphur fumes' from the generation of electricity, Sir H. Williams (Con., Croydon East) asking the Minister whether he would publish the technical report which led to the approval of the construction of the Bankside power station.

In short reply, Mr. Marples said that the technical advice given before the Bankside power station project was approved had already been made public. It was to the effect that sulphur and other noxious fumes could be eliminated, but that experiments with a pilot plant should first be carried out to determine the best method. That was done and a gas washing plant designed in the light of those experiments had been installed in the power station. Dissatisfied with this answer, Sir H. Williams contended that the plant had the effect of bringing down more sulphur fumes than if it had never been installed. Mr. Marples at once took expert scientific cover. 'There is, he explained, a technical conflict on that point. Tests made have shown that the average efficiency of the extraction of sulphur and other gases was 97.2% for the period between July and September, 1953, and 97.7% between October and December, 1953.' And he left the matter at that.

Mr. G. A. Isaacs (Lab., Southwark): 'As this power station is in my constituency, may I ask whether the Minister has received any complaints at all about sulphur fumes emitted from it, and what complaints he has received about grit and other substances from the old station? Is he aware that my constituents are anxious to see this power station in full operation, to save them from the abominable nuisance of the old power station? '

No answer was the brief reply.

Atomic Energy

Replying to a series of questions by Mr. Gerald Nabarro (Con., Kidderminster) concerning the estimated cost of construction and date of completion of the Dounreay (Caithness) atomic energy plant, Sir D. Eccles (Minister of Works) said that the plant at Dounreay would be 'an adventure into unexplored territory.' It was too soon to provide firm information on the points raised by Mr. Nabarro. Construction of the plant was expected to take four to five years. It was too early, because of developments which might be incorporated in the design, to give a definite figure of cost, but it might be of the order of £15 mill. For the same reasons, he could not estimate the output of electricity.

Answering Mr. J. Grimmond (Lib., Orkney and Zetland), Sir David Eccles said it was expected that the peak labour force for construction at Dounreay would approach 2,000, of whom half would be unskilled. When running, the plant would employ about 300 locally-recruited workers unskilled or semi-skilled.

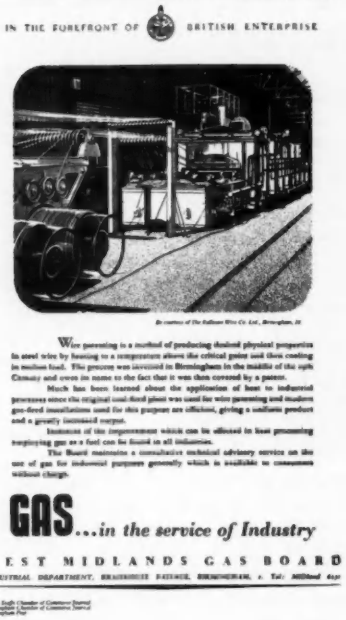
In the debate on the Atomic Energy Authority Bill, Mr. G. R. Mitchison (Lab., Kettering) said that it was wrong that the Minister responsible for the appointment of the members of the Authority (the Lord President of the Council) should be in the House of Lords and that there should be no-one in the House of Commons to answer for him other than the Minister of Works, who was brought into it merely because it was springtime and the parks were doing well. The Minister of Supply, contended, Mr. Mitchison, should be put in complete charge—which contention was strongly backed by Mr. George Darling (Lab., Sheffield, Hillsborough).

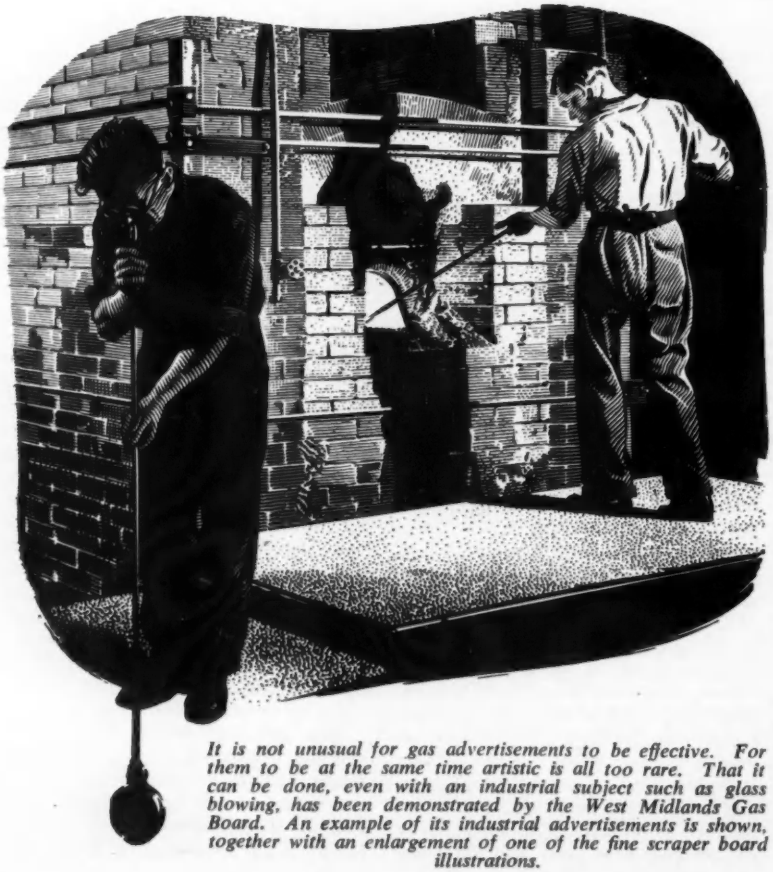
After further debate, Sir David Eccles said the acceptance of the amendment would lead to one Minister appointing the members of the Authority and another paying them and, in addition, having the general duty of seeing that

atomic energy was developed. The Lord President was clearly the most suitable Minister for the task. He was responsible for science generally and in contact with the universities and research organisations. He would hear the views of his colleagues when they came to represent the claims of the defence forces; of the Minister of Fuel and Power, who wanted to get on with the generation of electricity; of the Minister of Health, with his requirements in the field of medicine; of the Minister of Transport, with his needs in the way of mobile reactors for ships; and of the President of the Board of Trade, who would represent the claims of industrialists for isotopes for industrial purposes.

Mr. Nabarro opposed an amendment moved by Mr. A. M. F. Palmer (Lab., Cleveland) that one member of the Authority should be a person with wide experience in the generation and supply of electricity and that he should be appointed after consultation with the Minister of Fuel and Power. Mr. Nabarro's point was that it would be a mistake to create a "functional board." Sir David Eccles commented simply that, if any one section of users of electricity had a statutory right to a seat on the board, then there would follow a flood of claims for similar representation.

WEST MIDLANDS INDUSTRIAL GAS PUBLICITY





It is not unusual for gas advertisements to be effective. For them to be at the same time artistic is all too rare. That it can be done, even with an industrial subject such as glass blowing, has been demonstrated by the West Midlands Gas Board. An example of its industrial advertisements is shown, together with an enlargement of one of the fine scraper board illustrations.

Gas Meter History

Recently Mr. D. C. E. Poole, a Director of George Wilson Gas Meters, Ltd., assisted by Mr. J. E. Pashler, gave a paper on the history and development of gas meters at a meeting of the Coventry Engineering Society, which included a number of executives of the West Midlands Gas Board. Following the paper a useful discussion took place on such matters as lubrication, slide valves, and the contribution which George Wilson Gas Meters has made towards meter improvements. The paper first dealt with the period at the end of the 18th century and the early association of William Murdoch, Watt, and Bolton, when patents were obtained for compressing and supplying gas in containers. In December, 1815. Samuel Clegg (a pupil of Murdoch) and his assistant, John Malam, recognised the need for a metering device, and in 1820 Malam patented the first dry meter. The description, however, is not intelligible, and the idea was not immediately carried out. Further dry meter improvements were introduced at this time in America by Bogandus, Sullivan, Noon, Patterson, Defries, and Taylor. The price for gas first metered was 5½ cu.ft. per 1d. This was reduced in 1832 to 7 cu.ft. per 1d., and in 1849 the price was again lowered to about 14 cu.ft. per 1d.

Reference was made to the confusion which arose from the early rivalry of the various companies supplying gas in the Metropolis. In the early years the wet meter found most favour and the paper dealt in some detail with the function of the mechanisms. It was stressed that the early wet meter depended on maintenance of the correct water level for accurate registration, and that tilting of the meter could cause marked inaccuracies.

An improved wet meter was brought out in 1821 by Clegg and Crosley. This meter maintained accuracy of registration to within 5%. It was pointed out by Mr. Poole that wet meters have their present-day uses as large industrial and station meters, and also for accurate laboratory work.

The paper described Clegg's dry pulse meter patented in 1830 as 'A beautiful, ingenious, scientific toy,' and gave details of the mechanism, including the glass bulb, containing alcohol, and the lighted gas jet under the meter, which was essential for its function. In 1833 the Patent Dry Gas Meter Company produced a meter patented by Malam in 1820, and this single diaphragm, three port valve meter was described as a commercial failure. A further dry meter patented by Sullivan and produced in 1836 by Bogardus contained two diaphragms and four measuring chambers and was fitted with a rotary valve. Diaphragm failures appeared to be the downfall of these meters, in spite of efforts to preserve them with 'gold leaf.' In 1838 Defries patented a meter with six measuring compartments, three diaphragms, and three slide valves.

The paper went on to describe Richard's successful attempts in 1843 to develop a meter. The function was demonstrated, and it was stated that the modern domestic meter employs the same fundamental principle. In 1840 opposition was experienced to the admittance of the 'mystery box' and the termination of 'contract burning.' The end of the 19th century saw the finish of the wet domestic meter.

COMPRESSORS & EXHAUSTERS FOR AIR AND GAS.
See our Advertisement Next Week.
REAVELL & CO. LTD. IPSWICH.

CASES FOR BINDING
Quarterly Volumes of the 'Gas Journal'
5/- each, post free
Walter King, Ltd., 11, Bolt Court, Fleet Street, London, E.C.4.

AMAL
Calibrated Jets & Injectors
to meet a specification of consumption
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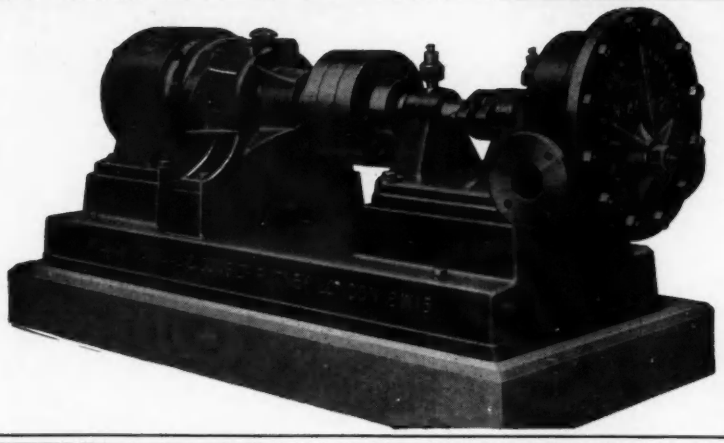
AMAL LTD., HOLDFORD ROAD, WITTON, BIRMINGHAM, 6



"THE DOUGLAS PUMP"
STEAM HEATED FOR TARS.
GOOD SUCTION SLOW SPEED
WILLIAM DOUGLAS & SONS LTD., PUTNEY - - LONDON, S.W.15.

PUBLISHERS' NOTICE

The "Gas Journal" is published every Wednesday, price 1/3d.; by post 1/5d.

Subscription Rates: Home and Empire:—52/- per annum; Foreign:—60/- per annum. (Both payable in advance.) A copy of the "Gas Journal" Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 1/9 per line (approx. 7 words)—minimum charge 10/6. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10" deep × 7" wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

MIDLANDS MANAGER: G. B. Torrance, 42, Wychall Lane, King's Norton, Birmingham, 30.

NORTHERN MANAGER: W. Q. Foster, 33, St. Helens Road, Harrogate. *'Phone:* Harrogate 84291.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: CENtral 2236-7. *Telegrams:* Gasking, Fleet, London.

OXIDE
DUTCH AND DANISH BOG ORE
SPECIALLY ACTIVATED OXIDE OF IRON
Oxide supplied on loan or sale outright.
Highest prices paid for Spent Oxide.
Send your enquiries to
GAS PURIFICATION & CHEMICAL COMPANY LIMITED
ESTABLISHED 1873
PALMERSTON HOUSE, OLD BROAD STREET, LONDON, E.C.2.
Telegrams: "Purification, Stock, London." Telephone: London Wall 5077

FIRE!
FREE BOOKLET FOR YOU ON
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Fascinating, new, multi-coloured brochure, "Fire!—Your Dangerous Servant," can be yours. It tells you why to get Nu-Swift before your fire risk becomes 3-dimensional. Send for it—NOW!
NU-SWIFT LTD • ELLAND • YORKS
In Every Ship of the Royal Navy

"KLEENOFF" *
THE COOKER CLEANER
"KLEENOFF"
FIBRE BRUSHES
RUBBER MOPS
"KAY-DEE" *
KETTLE DESCALER
For resale to the public, and in bulk for Works use.
BALE & CHURCH, LTD.
7, CROMPTON WAY, CRAWLEY, SUSSEX

APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

MAINLAYING AGENT required by old established Firm of Civil Engineering Contractors, to supervise and take complete control of several Mainlaying Gangs in Home Counties. Applicants must have a very thorough knowledge of Gas Mainlaying and be capable of turning out really first class work. A knowledge of Water Mainlaying also would be an advantage. Car provided and Superannuation scheme available after probationary period. Write in first instance, stating experience, salary and expenses required to No. 185, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

SCOTTISH GAS BOARD

LANARKSHIRE DIVISION
DIVISIONAL SALES AND PUBLICITY OFFICER

CANDIDATES should have sound experience in Sales and Publicity matters and be capable of organising and training Showroom and Sales personnel, including the organisation of Exhibitions, Showroom Window Displays and Sales Drives.

Salary £800/£1,000 per annum by annual increments of £40.

The successful candidate will require to pass a medical examination and be subject to the Board's superannuation scheme.

Applications stating age, training and experience and giving the names of two referees must be received by the undersigned not later than Saturday, April 10, 1954,

JAMES M. DOW,
Divisional Controller.

Divisional Offices,
Bothwell Road,
Uddingston.
March 17, 1954.

SOUTHERN GAS BOARD

EASTERN DIVISION
PORTSMOUTH, GOSPORT & BOGNOR REGIS GAS UNDERTAKING
CHEMIST

APPLICATIONS are invited for the position of CHEMIST on the Laboratory Staff of this Undertaking.

Applicants must have had experience of modern Gas Works Plant and processes and be familiar with all routine Laboratory Tests.

The commencing salary will be within Grades A.P.T. IV and V £320-£560 on an appropriate step according to experience.

Accommodation is available at a moderate rental, if required, and the successful candidate will be called upon to pass a medical examination and to subscribe to such Superannuation Scheme as the Board decide to adopt.

Applications, stating age, experience and qualifications, giving the names of two referees, should be received by the undersigned by April 15, 1954.

H. M. LAWRENCE,
Engineer & General Manager.

Gas Offices,
The Square,
Portsmouth.

WEST MIDLANDS GAS BOARD

WARWICKSHIRE DIVISION
HINCKLEY DISTRICT
PRODUCTION ENGINEER

CANDIDATES should possess the Institution of Gas Engineers Higher Grade Certificate in Gas Engineering (Manufacture) and have had considerable carbonising experience, preferably with Woodall-Duckham Continuous Plant, and be fully conversant with normal production procedure and maintenance of plant.

The salary will be in accordance with Grade IX (£635-£735) of the Salary Scales of the National Joint Council for Gas Staffs.

The post is pensionable and the successful candidate will be required to pass a medical examination.

Applications, giving details of age, qualifications and experience, together with the names of two referees, should be addressed to Mr. A. Allen, Divisional General Manager, West Midlands Gas Board, Warwickshire Division, Gas Street, Coventry, to reach him within fifteen days of the appearance of this advertisement.

F. H. CURETON,
Secretary to the Board.

WEST MIDLANDS GAS BOARD

ASSISTANT ENGINEER (CIVIL)

THE successful applicant will be in the Chief Engineer's Department and will be responsible for the oversight and control of the construction of roads, foundations, and reinforced concrete structures, initially at the Walsall Works where substantial extensions are in progress.

Experience in carrying out similar work is essential and membership of the Institution of Civil Engineers would be an advantage.

The commencing salary will be not less than £900 per annum.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with the names of two referees, should be addressed to the Industrial Relations Officer, West Midlands Gas Board, 6, Augustus Road, Edgbaston, Birmingham, 15, to reach him within fifteen days of the appearance of this advertisement.

F. H. CURETON,
Secretary to the Board.

NORTHERN GAS BOARD

BLYTH DIVISION

APPLICATIONS are invited for the position of MANAGER of the Berwick-on-Tweed Unit.

Applicants should be Corporate Members of the Institution of Gas Engineers, and preferably experienced in the operation of Intermittent Vertical Chambers.

The appointment will be subject to the terms and conditions of service set out in the agreement of the National Joint Industrial Council for Gas Staffs, and the commencing salary will be within the range of Grade A.P.T. II (£715-£840).

A rented house is available at the Works, if required.

The successful candidate will be required to pass a medical examination and be subject to the Board's Superannuation Scheme.

Applications giving all relevant details and the names of two referees should be received by the undersigned within fourteen days of the publication of this notice.

W. SUTCLIFFE,
Divisional General Manager.

Bridge Street,
Blyth,
Northumberland.
March 16, 1954.

NORTHERN GAS BOARD

SUNDERLAND DIVISION
CHIEF ENGINEER (PRODUCTION)

APPLICATIONS are invited for the position of CHIEF ENGINEER (PRODUCTION) at a salary of £1,200 per annum.

The successful candidate will be entirely responsible for day to day management of the Sunderland Works (maximum output 11 million cubic feet per day) with supervisory works control of smaller units within the Division.

Applicants must have sound practical experience of the operation and control of gas works plant which includes Horizontal and Intermittent Vertical Retorts, Carburetted Water Gas (large scale automatic) and usual ancillary plant. Good organising ability and experience in a similar position is essential.

Candidates should hold recognised qualifications in Gas Engineering, Chemical Engineering, or Fuel Technology.

The successful candidate will be required to pass a medical examination and to join the Board's Staff Superannuation Scheme.

Applications, giving full particulars of age, education, qualifications, training and experience, should be submitted to the undersigned not later than fourteen days after the publication of this advertisement.

W. O. KIRKWOOD,
Divisional General Manager.

Fawcett Street,
Sunderland.
March 15, 1954.

PUBLICITY OFFICER required in London by a leading firm specialising in the manufacture of domestic and industrial gas appliances. The position calls for a wide knowledge of publicity and applicants must have had previous experience in advertising and publicity, with particular ability in relation to copy-writing and the preparation of editorial matter. Starting salary will be commensurate with ability, experience and age. Pension scheme. Write giving full particulars of age, experience and salary required to: No. 187, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

PATENTS

KINGS PATENT AGENCY, LTD.
(Director, B. T. King, A.I.M.E., Patent Agency) Advice, Handbook, and Consultations free. 146a, Queen Victoria Street, London, E.C.4. 'Phone: City 6161.

PLANT FOR SALE

FOR SALE:—Ruston Waste Heat Boiler, 15,000 lb. evaporation, 125 lb. working pressure with super heater. Apply: No. 186, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

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NATURAL BRITISH.
BOG (DUTCH and DANISH) ORE.
SPENT OXIDE.
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Telegrams: "BRIPURIMAT"
Telephone: 59086

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ALBION WEST BROMWICH
S.B
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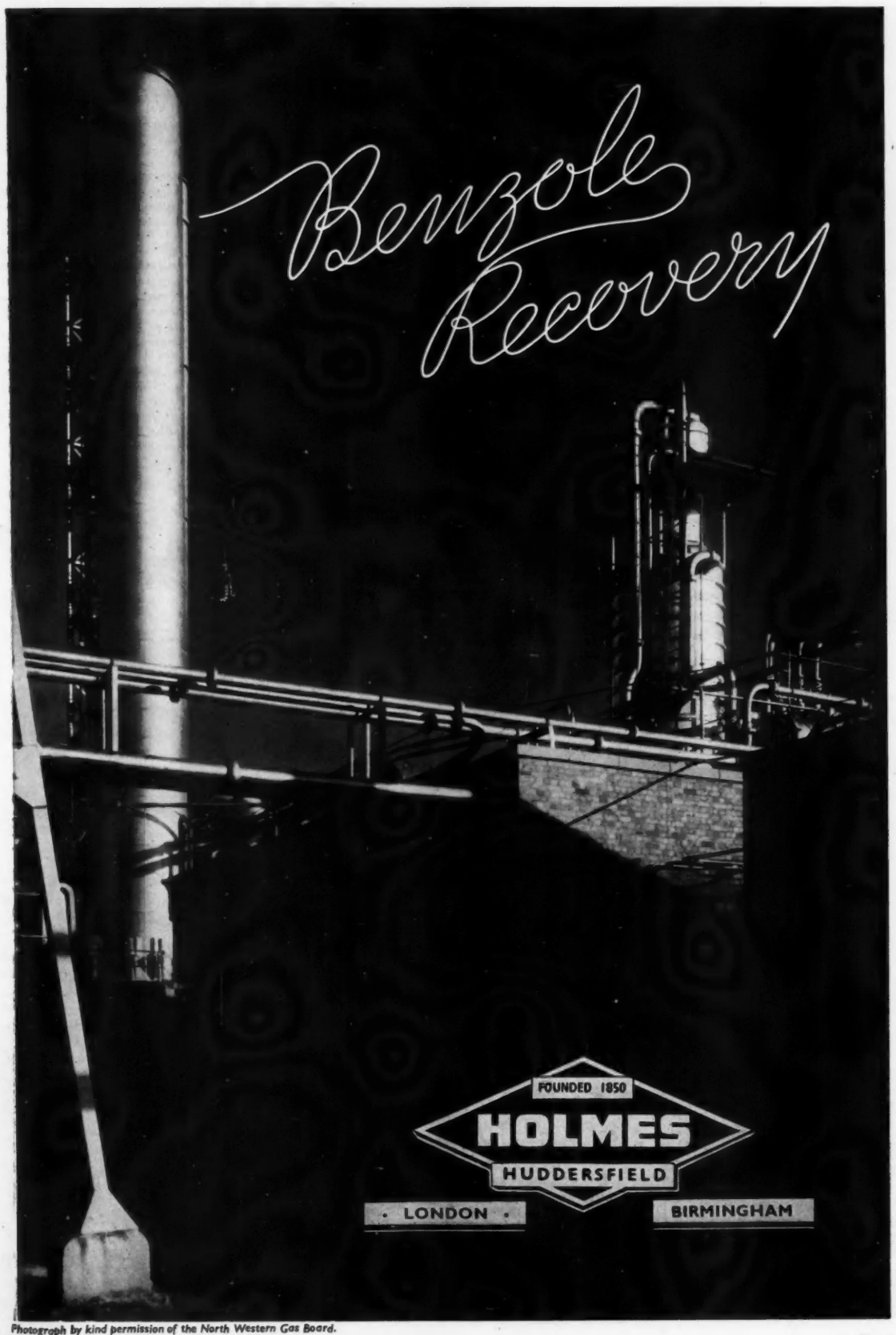
WEST BROMWICH 0436-7



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C267

WHY

man-cooling?

BECAUSE MEN CANNOT WORK at full stretch under the oppressive conditions existing in industrial "hot spots" without some means of relief. Often they resort to "taking a breather". But "breathers" are costly and time-wasting.

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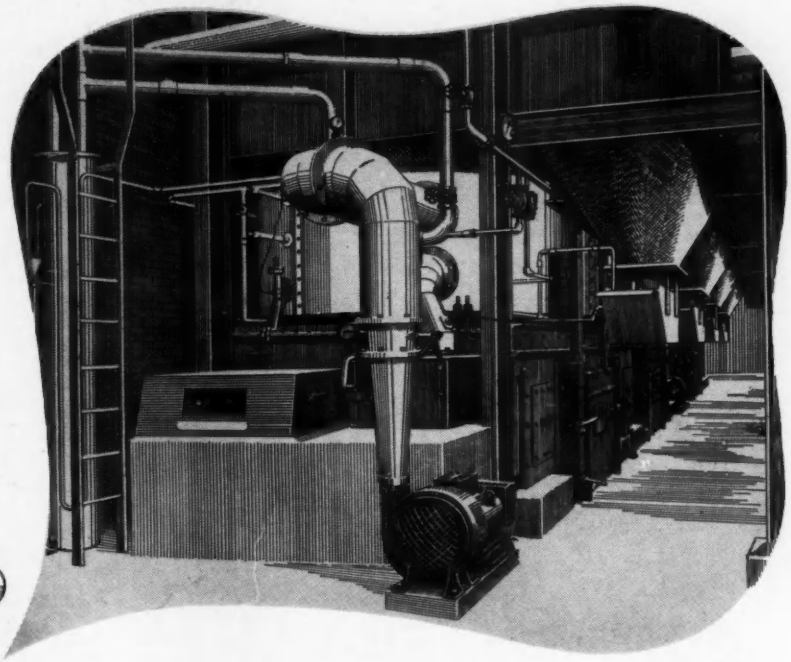

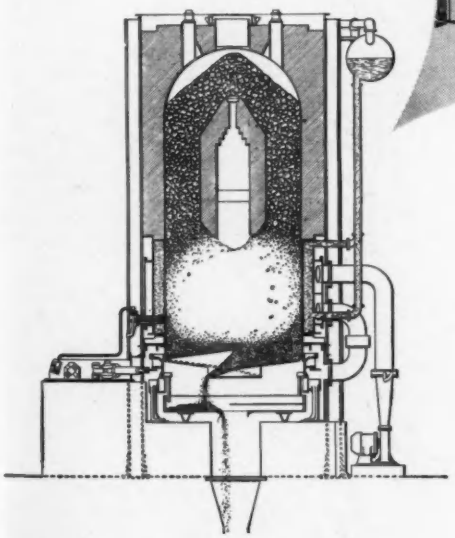

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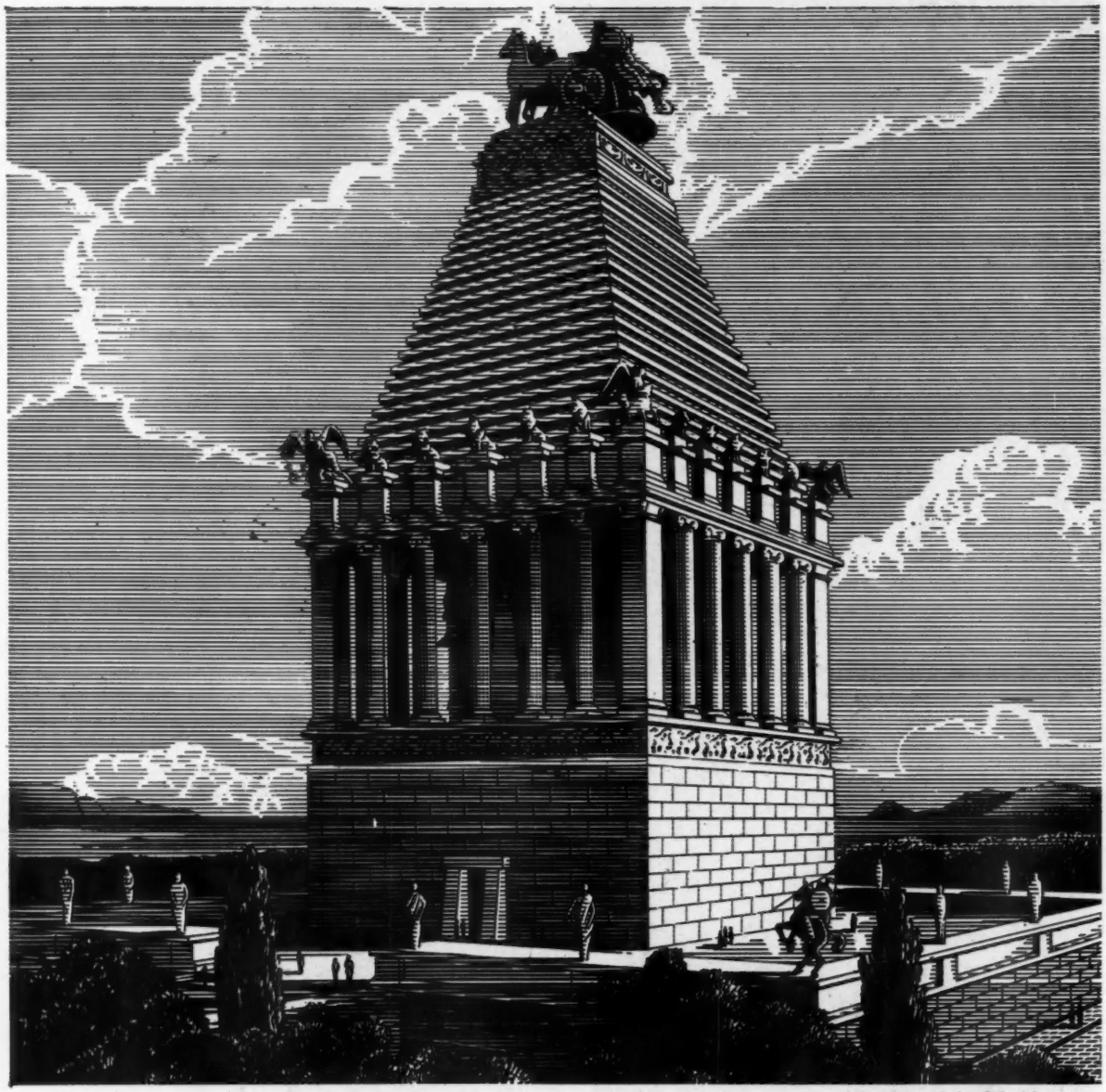

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